Volume 20, No. 8

August 2001

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## Mønitoring Times-

# Calming the Storm: RADIO BEHIND BARS







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133,2500 MHz	SAGINAW NICH	USA	Aviston	SASINAW MICH RADIO	AN		
133,2500 MHz	THERMOPOU WYO	USA	Aviston	THERMOPOLI WYO RADIO	M		
133.3000 MHz	GOODLAND KAN	USA	Aviston	GOODLAND KAN PADIO	AN		
133.3900 MHz	AUSTELL 64	USA	Aviation	AUSTELL GA PADIO	AN		
133.3900 MHz	NAFIETTA GA	USA	Aviation	MARIETTA 64 RADIO	AN		
133.4000 MHz	AUSTINITEX	USA	Aviation	AUSTIN TEXTADIO	AN		
133.4000 MHz	FLORENCE SC	USA	Aviation	FLORENCE SCRADIO	AN		
133,4000 MHz	WHITEFISH MONT	USA	Aviston	WHITEFISH MONT RADIO	AN		
133,4900 MHz	TONOPAH NEV	USA	Aviston	TONORSH NEV RADIO	AN		
133,5000 144:	AURORA LL	USA	Avioton	AUBOBATH BADIO	M		

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#### CONTENTS



Vol. 20, No. 8

August 2001



On our Cover

### Folsom State Prison

#### **Radio behind bars**

#### By John Maky

Running a correctional institution is like the running of a small city, except that in a normal city counting the bars on an oven rack wouldn't be part of the daily routine. In such a complex operation – one in which officers are outnumbered and unarmed – communications are critical to the safety of officers and prisoners alike.

The author, a retired California State Correctional Officer, walks us through an imaginary day in his shift as a gun officer inside Folsom Prison to demonstrate the importance of radio communications in maintaining order. Frequencies are provided for the present-day trunked system for Folsom, which is no longer a maximum security prison. Story starts on page 10.

For the Federal Bureau of Prisons communications and trunked systems, check out this month's *Federal File* on page 64.

Cover photo: John Maky as 2A gunner inside Folsom in 1993.

### Scanning in the Granite State......12

#### By John Mayson

New Hampshire is one of the last states to get onto the trunking bandwagon, so there's still a lot to hear with a simple scanner. Here's a comprehensive look at public safety channels in the Granite State. If you visit the Old Man of the Mountain or go leaf peeping in the fall, be sure to take your scanner!

### ACARS Message Decoding and AirNav 3......17

#### By Jean Baker

ACARS is a digital data link which allows airline companies to communicate with their fleet, while relieving congestion on the voice channels. Fortunately, the hardware and software to decode the digital signal is easily available and hobbyists can follow right along. Jean Baker introduces you to the most popular options.

The Internet has made opportunities available to the hobbyist that were previously unthinkable – such as real-time aeronautical tracking and SELCAL decoding available from AirNav Systems.

For other aero-related stories this month, see *Plane Talk*, *Service Search*, and the *MT Review* 

### Who's Listening? A Listener Profile ......21

#### By Robert Wyman

This feature started out as a few paragraphs in the *Scanning Report* column, but there was no way the subject's scanning experience could be summed up in a few paragraphs. Wade C. Langley is a prime example of a hobbyist who learned about communications on his own, and who has been sharing his passion working and volunteering in public service since the age of 15.





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## Reviews:

When you add a GPS receiver to DeLorme's mapping software, you have an impressive constellation of products. Catalano tests DeLorme's Earthmate GPS receiver coupled with Road Warrior software installed in his laptop and he's set to go! (p.80)

Despite its all-mode sophistication, the Icom IC-706MkIIg amateur radio transceiver nearly passes the Jock Elliott idiot test,

it's so easy to operate. And its performance sparkles (see p.86).

Another superb flight-tracking product is Flight Explorer Personal Edition from Avweb, which is available for a very reasonable subscription (see p.87).

On the satellite side, Ken Reitz introduces the Motorola **4DTV Sidecar**, which allows your analog receiver to decipher DigiCipher II channels (p.24).

#### TABLE OF CONTENTS

Washington Whispers	4
LPFM: Giving a Voice to the Voicel	
Letters	
Communications	
Stock Exchange	
Advertisers Index	90
Department Staff	90
Closing Comments	
LPFM Hypocrasy?	
First Departments	
Getting Started	
Beginners Corner	24
Motorola's DCII Sidecar	
Ask Bob	26
Bright Ideas	
Scanning Report	
Scanning Smorgasbord	20
Service Search	30
Fixed Base Company Frequencies	30
Utility World	32
	32
WLO Marine Radio Network	00
Utility Logs	33
Digital Digest	35
Mysteries Solved, ALE, PACTOR	
Global Forum	36
Changes in US Gov Broadcasting	
Broadcast Logs	39
The QSL Report	40
Lighthouse Weekend a Beam for DX	(ers
Programming Spotlight	41
Discovering Lots of Life on SW	
Listening Guide	
English Language SW Guide	42
MT Satellite Service Guide	62

he QSL Report	
Lighthouse Weekend a Bo	
Programming Spotlight	41
Discovering Lots of Life	on SW
Listening Guide English Language SW Guide MT Satellite Service Guide Solidaridad 2, SATME, Marelos 2	62

Second Departments	
View from Above  Images from NOAA-16	63
The Fed Files	64
Federal Bureau of Prisons	,,
Tracking the Trunks	66
The Digital Side of APCO-25	/0
Plane Talk	68
Alphabet Soup American Bandscan	70
	/0
Regional Roundup Outer Limits	71
Outer Limits	/ 1
Below 500 kHz	72
LF Receiving Antennas - III	12
On the Ham Bands	74
Dog Days in the Great Outdoors	′¬
Radio Restorations	76
The SW-54 Plays Again!	, 0
Antenna Topics	78
Antenna for VHF and Higher	
MT Reviews	
Computers & Radio	80
DeLorme's GPS Receiver and Mapp	-
Radio Equipment	82
Synthesizers and How They Work	- ]]
Scanner Equipment	84
Ask Another Bob	
Easy Access	86
Icom's IC-706MkHG – Part H	

MT Review ...... 88

Flight Explorer Personal Edition

What's New ...... 89



## LPFM: Giving a Voice to the Voiceless....

Even though Congress, the National Association of Broadcasters, and National Public Radio tried to derail the FCC's Low Power FM radio initiative, the Commission plowed ahead and has continued to accept applications for LPFM construction permits. The NAB was primarily concerned about interference and competition to existing FM stations. (See guest editorial on p.92 - rb)

Prior to adopting LPFM, the Commission said it conducted four major technical studies of 75 consumer FM radio receivers of various types and performance capabilities, including automobile radios, component tuners or receivers, portable radios such as "boom boxes," personal radios such as "Walkman" type units, and clock radios, and concluded the interference potential to full service FM broadcasters was minimal.

The first ten day filing window closed on June 8, 2000. It has taken a year, but now all U.S. states and territories have had an opportunity to apply to operate a Low Power FM broadcast station. The last two filing windows were consolidated to speed the filing process, and the fifth and final window closed on June 15, 2001 for applicants in the remaining areas

Three LPFM power levels were originally proposed: LP-1000 (up to 1000 watts effective radiated power), LP-100 (50 to 100 watts) and LP-10 (up to 10 watt "micro-stations.") The FCC opted to only approve (at least for now) the LP-100 stations which will serve an area with a radius of approximately 3.5 miles from the transmitter.

#### Congress puts damper on LPFM

Earlier this year, Congress mandated two rule changes, requiring that LPFM stations meet prescribed minimum distance separations to full service FM stations operating on third adjacent channels. This drastically cut down on the number of LPFM stations that could be approved. Initially the FCC asked that the minimum separation be to stations operating on the second adjacent channel.

The Commission pointed out that over

400 full-power FM stations authorized prior to November 1964 do not meet the 3rd adjacent channel protection requirements and that these "short spaced" FM stations have consistently met the Commission's criteria for distortion-free signals.

Congress also prohibited an applicant from obtaining an LPFM license if that candidate had ever engaged in any manner in the unlicensed operation of any station. The Commission had initially said that "pirate" broadcasters would be eligible for a LPFM license if they certified that they promptly ceased operations when notified of their violation by the FCC and, in any case, ceased operations as of Feb. 26, 1999. Congress and the NAB were vehemently opposed to that idea.

To qualify, each LPFM applicant had to be a non-profit educational organization or institution ...or must propose a noncommercial public safety radio service.

#### **♦ LPFM** applications pour in...

The FCC made it easy for applicants by posting an online FM Channel Finder utility to the Internet to help applicants find a vacant frequency in their area. The program even incorporated the protection of third-adjacent channel stations ordered by Congress.

Over a thousand LPFM broadcast applications have already been accepted. That doesn't mean that each will be awarded a construction permit since there are a great many applicants asking for the same channel. Some of the types of LPFM stations are interesting. At least one Amateur Radio club applied; the Hancock County Amateur Radio Assoc., Inc., of Bay Saint Louis, MS, requested 103.5 MHz.

Here is a sample of the wide variety of organizations and locations applying for LPFM licenses:

Athens, GA, Athenstown Media Enthusiasts Assoc.; Mansfield, LA, First Baptist Church; Sitka, AK, Sitka Tribe of Alaska; Ocean City, MD, Edinboro Early School; Opelousas, LA, Southern Development Foundation - Field Office; Newport, RI, New-

port Musical Arts Assoc.; Yarmouth, ME, Maine Science & Technology Museum; Crescent City, CA, College of the Redwoods; Chico, CA, Radio Education Associates (REA); Hammond, LA, Parentcorp Foundation; Frogtown, GA, Frogtown Community Radio; Ada, OK, Pontotoc Educational Radio; Warsaw, IN, Blessed Beginnings; Rockland, ME, Penobscot School; St. George, UT, Assoc.of Community Resources and News (ACORN); St. Hope, AK, North Slope Borough School Dist.; Valparaiso, IN, Neighbors Corp.; St. George, UT. Latinos Unidos Broadcasting: Tallapoosa, GA, Georgia Dept. of Transportation; Atlanta, GA, Fellowship of Holy Hip Hop, Inc., Malibu, CA, Pepperdine University; Red Bluff, CA, Red Bluff Joint Union High School Dist.; Logan, UT, City of Logan; Hemet, CA, N. American Indian Mission; Tok, AK, Duct Tape Radio & Humanities Forum; Gore, OK, Cherokee Communications Council; Athens, GA, Web Rights Association; Porterville, CA, Lawyers 2nd Amendment Society; Oroville, CA, Bird Street Media Project; San Clemente, CA, Setec Astronomy Club; Notre Dame, IN, Voice of The Fighting Irish; English, IN, Advanced Search & Rescue; Slidell, LA, Crisis Pregnancy Help Center of Slidell; Georgetown, CA, American River Folk Society; Bartlett, NH, Jackson Ski Community Radio Assoc; Glen, MS, Write to Read Radio; Fort Scott, KS, Mercy Health System of Kansas; Esko, MN, Esko Senior Citizens; Canton, MS, Canton Convention & Vistors Bureau; Kansas City, KS, United Nation of Islam; Farmington, CT, The Broadcasters Club; Yerington, NV, Rite of Passage Athletic Training Centers & Schools; Gulfport, MS, Gulfport Job Corps Center; St. Marvs, KS, St. Marys Academy Home Study School Assoc.; Mt. Pleasant, MI, Children Saving Children Services, and on and on....

As you can see, there is a very wide variety of potential Low Power FM broadcasting stations coming to the airwaves near you!



#### In Defense of the BBC

Last month we ran a guest editorial by John Figliozzi. The BBC submitted a rebuttal, but there wasn't room to run it in the same issue. Here is the BBC's explanation of their decision to discontinue shortwave service to North America and Australia.

#### A message from Mark Byford, Director BBC World Service

In July we [are] making changes that will affect the way some of you will be able to receive BBC World Service in English on short wave.

You'll still be able to hear all of your favourite programmes, but from July 1, 2001 we will be focusing our delivery in English to North America, Australia, New Zealand and the Pacific Islands on our numerous re-broadcasting partnerships on FM and MW together with comprehensive access via our online site. Our short wave services to the rest of the world are unaffected by this decision.

As I'm sure you're aware, in the most developed markets, there has been a real revolution in the way people access the media. In these areas, and in response to the way people now listen to our services, we are making a transition from short wave delivery to FM and web delivery, as well as radio by satellite and cable and via mobile devices.

The World Service in North America, Australia, New Zealand and the Pacific Islands will continue to be accessible via online and through our many re-broadcasting partnerships on FM and MW. Our mix of international news, analysis and features is available on many local stations across North America, Australia and New Zealand and access to the World Service in audio is available via our website

The changing needs in this competitive market have developed such that it is the appropriate time to make these changes in relation to short wave distribution. The savings we make can then be re-invested in building our FM presence across the world and in new Internet developments. Internet availability and usage is already high across North America, Australia and New Zealand. Among our target group of opinion formers and decision makers, in the developed world, it represents a key way of accessing us rather than through shortwave.

We are not pulling out of North America, Australia, New Zealand and the Pacific Islands. On the contrary, we are developing new methods of listening to us in good quality. You will find that our service is available via the Internet: good sound quality with programmes on demand as well as streamed live, plus more information and background to programmes. You will find us available in other languages; 24-hour Spanish output will become more widely available via the web for example. We intend to take advantage of new delivery methods coming on stream, for example, in the United States of America; this includes the Sirius and XM digital radio services.

You may have read that we are investing large amounts of money in upgrading short wave facilities covering the Middle East, The Gulf and Asia. This is because in those parts of the world the vast majority of our audiences still use shortwave as a primary way to access our programming and that's why we are upgrading our shortwave transmitters for these regions. (In fact it is highly probable, given the nature of short wave transmissions, that North Americans will still pick up our short wave transmissions from our Antigua or Singapore transmitters)

In North America, Australia, New Zealand and the Pacific Islands, this is no longer true. In the United States, for example, nearly three times as many people listen to us on FM as short wave and one and a half million users access us Online each month.

BBC World Service is the world's largest international radio broadcaster and, with over 153 million regular listeners, will remain so after these changes. We are constantly facing the challenges of a rapidly changing media environment, but we're committed to ensuring we are meeting the different needs of our target listeners.

We are at the forefront of harnessing new distribution partnerships to provide you with the programmes you want, when you want to hear them. The changes to our transmission services reflect our commitment to our role in a modern, media world.

Wherever you are in the world you can hear BBC World Service 24 hours a day at http://www.bbc.co.uk/worldservice. There are two offerings - news 24 hours a day plus a full 24-hour schedule including features and music.

Full frequency information can be found at http://www.bbc.co.uk/worldservice/schedules, or a list can be sent to you if you ring +44 207 5571270 and leave your name and address on our answering service

As well as via the World Service website North Americans can hear BBC World Service as follows:

The BBC is available on many FM stations across the United States. More than 2.3 million people now listen to us through public radio. Through our public radio partners we are now available in over 200 American cities.

We are also available via satellite alongside C-SPAN TV and this year we are launching on Sirius and XM radio, the new digital satellite services. Sirius will carry the all-news service, and XM Radio will carry the mixed schedule. For more details see http://www.bbc.co.uk/worldservice/americas

BBC World Service is available on some nationwide FM stations including CBC in Canada. For local CBC frequency information visit http://radio.cbc.ca/channelguide



Wanna know where to go for some elbow room? Or for LF DXing? There's not much unwired territory left! Larry Van Horn discovered this nighttime satellite photo at http://antwrp.gsfc.nasa.gov/apod/image/0011/earthlights\_dmsp\_big.jpg

#### No Need to Panic

Assistant Editor Larry Van Horn has expressed a point of view regarding the BBC shift which is at odds with many vocal radio listeners. He expressed his opinion as follows:

"I wouldn't draw the shutters and put the hobby to bed yet as others have forecasted to happen because of the BBC. I talk to hundreds of customers each week here at Grove and when I ask then specifically what they want to hear (we try to help people get the right radio), rarely do I hear the BBC mentioned.

While column editor for MT's Ute World for 10 years, I heard from all sorts of folks that shortwave was dying. But you know what amazes me: when one service or station leaves, something else is there to always take its place.

The squeeze on the SW spectrum and its users is significant. When you talk to US broadcasters they say it is the lack of spectrum that forces them to operate outside the normal shortwave bands. So where is the shortage of things to listen to on shortwave? Broadcasters only account for about 12% of the spectrum, their bands are full, and they are screaming for more

I don't see SW portable sales slipping one little bit because the BBC decides to pull the plug on NA."

– Larry Van Horn, Ass't Editor, MT columnist

#### Prop Plane Contrails - a Correction

Bob Grove says, "A number of readers

pointed out my oversight when I said [in June Letters that prop planes don't produce contrails; indeed they do. Growing up in Cleveland, Ohio, before the jet age, I used to watch prop planes – and their contrails! As several pointed out, they rarely fly at the altitudes required to produce the significant trails which we see from the jets.

John Frank, K3IC, mentioned how much World War II bomber pilots hated the contrails because they were like a finger pointing straight to them. Similarly, Doc Bryant of Midland, Texas, remembered, "During pre-mission briefings, the Weather guessers would often include the height above which contrails could be expected to form (the contrail height) so that pilots could fly below that altitude to eliminate that white target indicator!"

An FAA employee who wrote to correct the record said, "had you not given the sane, rational, and informed response you gave in that issue I might well have stopped reading all radio hobby magazines. ... Seriously, I'm glad you have never succumbed to the rampant paranoia and irrational thinking that seems to abound in the radio hobby. I've enjoyed your magazine since I re-entered the listening hobby in 1991, and you have consistently been a voice of reason."

#### On the Right Track

"I just want to say great job to Matthew Sadler, Larry VH (for the frequency information) on the timely article on railroad monitoring. With my office about 100 feet from the major railroad tracks that go through Springfield, MA, I now have a very good understanding about the radio systems involved in supporting railroad operations.

"Of course every time I leave the portable scanner in the car is when something happens and I can't listen to it ..."

-Ken Windyka, Springfield MA Monitoring Area

#### More on the Grounded Loop

Randall Trapp, MDXC DXpedition Coordinator, wanted to clarify some details about the loop antenna described in Doug Smith's June American Bandscan column.

He says, "the two ground rods (one for the antenna and another one for the ground return line to the cabin) were installed with the aid of an ice auger and a fence post driver." The ground rods were not driven into the frozen ground as implied, but the DXers made use of a frozen lake near the tree which served as the antenna tower. In a shallow section of the lake, they drilled through about 1 foot of ice, passed through 4 or 5 feet of water, and then drove the rod 2 or 3 feet into the lake bed.

We welcome your ideas, opinions, corrections, and additions in this column. Please mail to Letters to the Editor, PO Box 98, Brasstown, NC 28902, or email mteditor@grove-ent.com. Happy monitoring!

-Rachel Baughn, KE4OPD, editor

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#### COMMUNICATIONS

## Coming soon: Overseas flight tracking

Will aeronautical HF radio services go the way of maritime coastal radio? For the frustrated crews and companies involved in oceanic flights, the day they get rid of "the HF relay game" can't be soon enough.

"Let me put it this way," said Martin Cernese, eastern region director for ARINC, a contractor that provides communication services for aircraft headed overseas. "The first transatlantic flight was in 1938. We're pretty much doing it the same way today."

Just east of Newfoundland, communication by VHF radio between aircraft bound for Europe and air traffic controllers on the mainland is no longer possible. For the next five hours, the pilots are on their own, with no radar tracking their flight paths and no direct radio contact with controllers on the ground. Because they must rely on periodic position reports to estimate a plane's location, oceanic controllers must keep planes between 60 and 120 miles apart for safety. At the current rate of growth in the number of transoceanic flights, the Federal Aviation Administration estimates that overseas flights could be held on the ground by 2005 because of congestion over the ocean.

However, in late June the Federal Aviation Administration was expected to award a contract to Lockheed Martin to overhaul the way aircraft are handled across the Atlantic and Pacific. Within three to four years, controllers at the nation's three air traffic control centers who handle overseas traffic could be able to look at a screen and view the real-time position of aircraft using the Global Positioning System. And instead of having to rely on HF (high frequency) radio operators to contact pilots, they will be able to use satellites to send high-speed e-mail messages directly to the cockpit.

It's a move that will be welcomed by the airline industry, but how it will affect those of us who love to listen remains to be seen. Stay tuned!

#### Radios fail; Firefighters trapped

In mid-June, firefighters in Claymont, Delaware, were engaged fighting a house fire when one noticed a flashlight beam flitting back and forth through a hole in the floor. A firefighter had fallen through the floor into the basement and had been unable to raise help with his radio. As one would-be rescuer crawled forward on his stomach to reach the stranded man, the floor gave way and he also fell in the basement.

"I'm freaking out because ... I figured they were down there burning," his companion said.

The captain ran outside to get help be-

cause none of their radios could be heard. The deputy chief, who was at a command center outside the house, said he did not know that anyone was in trouble. No one on the scene got the evacuation notice, and firefighters remained at their posts, unaware others were trapped.

Runners were used to relay basic information to crews, such as where to point their hoses and provide ventilation. Those stationed at the back of the house had tried several times to tell the command post about the men. "He was maybe 150 feet away from me, 200 feet, and I couldn't hear him over the radio," the deputy chief said.

Firefighters were able to pull the two men to safety using a ladder.

Emergency workers have long complained about dead zones in the state's \$50 million 800-megahertz system that went online in 1999. This incident was traced to a circuit breaker in a signal booster which had been added after the problems emerged. However, the equipment does not have an alarm to alert anyone if the circuit breaker trips.

The Legislature recently approved spending an additional \$4.3 million for repairs that would include the Claymont area. Claymont fire officials will consider switching to their old radios because of the latest problem, the deputy chief said.

#### Mobile phones reveal stealth bombers

"The front of the stealth plane cannot be detected by conventional radar, but its bottom surface reflects very well," says Mr. Peter Lloyd, the head of projects at the British-based Roke Manor Research. Mr. Lloyd uses mobile telephone calls bouncing between base stations to produce a screen of radiation. When aircraft fly through this screen they disrupt the phase pattern of the signals. The Roke Manor system uses receivers shaped like television aerials, to detect distortions in the signals.

Using a laptop connected to the receiver network, soldiers on the ground can calculate the position of stealth aircraft with an accuracy of 10 meters with the aid of GPS data. A network of aerials large enough to cover a battlefield can be packed in a Land Rover, said the London *Telegraph* article.

Mr Lloyd said. "It's almost impossible to disable a mobile phone network without bombing an entire country, whereas radar installations are often knocked out of action with a single bomb or missile."

"... let's say the US military is very interested."

#### Scanners and The Law

States and even municipalities differ in whether scanners may be monitored while in

a vehicle. Most of those that don't allow it have made exceptions for public service volunteers or workers who need to be able to hear communications in order to perform their jobs. But some law enforcement agents just never seem to "get it."

Scott Heath KC8EMH of Albion, Michigan, was pulled over for a failed tail light. When the officer heard Scott's handheld Bearcat 200 scanner, he confiscated it. Scott was arrested and jailed when they verified it was programmed with police frequencies. They refused to accept Scott's Amateur Radio Operator's license (Technician Class) as license to carry the scanner, even though Michigan law clearly exempts hams, including Technician class, from the prohibition



#### August 11: St Louis, MO

Baseball Brain Bowl benefit for four St. Louis police families. Trivia contest on the subject of baseball. Contact Bill Moushey, 4255 Louisiana Avenue 63111, St Louis Missouri (314) 353-7296

#### August 11: Longview, WA

Lower Columbia A.R.A. 10th Annual Swap Meet. Cowlitz Co. Expo Center, 9 a.m.-1 p.m. Talk-in on 147.26+, pl 114.8. Adm \$4. Bob Morehouse, KB7ADO, (360) 425-6076 eves.; KB7ADO@aal.com Flyer at: http://www.qsl.net/nc7p/or write LCARA, POB 906, Longview, WA, 98632.

#### August 12: Lexington, KY

Bluegrass ARS Central KY Hamfest at National Guard Armory adjacent Lexington, KY, airport, 8am-4pm. Talk-in 147.765/.165, adm \$6. Fleamarket, license exams, forums, special event station, power-line safety demonstration; airconditioned. Contact John Barnes KS4GL (216 Hillsboro Ave, Lexington, KY 40511-2105; 859-253-1178 evenings) or *jrbarnes@iglou.com* or http://www.qsl.net/k4kiq/

#### August 18-19: Huntsville, AL

Huntsfield Hamfest at Von Braun Center, 700 Monroe St., Huntsville, Alabama; Talk-in: 146.94(-), 9a.m.; adm \$6. License exams both days 10:00 a.m. Forums, giant dealer show and flea market, DX banquet, major door prizes. Hospitality rooms at Hilton. Huntsville Hilton special Hamfest rates (256)533-1400. General Info - (256) 880-8004 or http://www.hamfest.org

#### August 18: Madison, WI

8th Annual Madison Get-Together for DXers and Radio Enthusiasts, beginning at 1 p.m. Hobbyists in all areas of radio are welcome. Contact host Tim Noonan at DXing2@aol.com for more information.

#### August 24-26: St Louis, MO

IRCA/DecalcoMania convention at Best Western Airport Inn, 10232 Natural Bridge Rd, St Louis MO 63134 . Host Mike Sanburn (PO Box 1256, Bellflower CA 90707; mikesanburn@hotmail.com). Hotel 1-800-872-0070 or (314) 427-5955. Registration \$35/person. Contact Mike or visit http://www.geocities.com/nOuit/irca2001.htm Station tours, video presentation, banquet, auction

#### COMMUNICATIONS

against receiving police communications in a vehicle.

Indiana requires a permit be issued in order to carry a radio capable of receiving police frequencies in a vehicle. Kokomo, Indiana, Sheriff Jerry Marr says he routinely gives permission to anyone who asks, and confirmed he gave permission to Jeff Collins, who was arrested in early June for monitoring police activities from his car. Collins is under investigation for suspected criminal racketeering. Former Kokomo Chiefs and Sheriffs are up in arms about Marr giving out "secure" frequencies - even though Monitoring Times has confirmed there is nothing secure about them: they are the same frequencies published in any *Police Call* or on any FCC database.

In spite of Kokomo Police Chief Charlie Hackett claiming "the sharp criminals use those frequencies to get the location of officers," we almost never hear of scanners used in the commission of a crime. Case in point: An article from Dispatch News referred to another Indiana incident. The article says (italics ours): "In a rare case of documented scanner use by a criminal, a Morgan County (Ind.) sheriff's deputy was shot 5 times and seriously wounded by a burglary suspect who later admitted he heard the officer run his plate on a scanner."

This burglar did not get away either. Guess sharp criminals are few and far between

#### Hands-off in New York

The state of New York approved a measure that would make the state the first in the nation to ban drivers from using hand-held cell phones. The new law goes into effect December 1st. At least 35 other states are considering such restrictions, but none have yet adopted comprehensive legislation. Twenty-three countries have already passed laws banning hand-held cellphone use while driving (including England and Israel-see following story).

#### Cellphone health, humor, and ... well, you decide

The British Medical Association has said that even a hands-free cell phone can be dangerous while driving. They also said there were large gaps in the research regarding the safety of electromagnetic fields emitted by the phones.

The U.S. Government Accounting Office has also concluded that current research is not adequate to guarantee the safety of cellphone emissions because there is not enough information available to assess longterm effects.

In Israel, where cellphone use verges on obsession, a full orchestra played a composition entitled "Spring Cellphony" - a 10minute medley of classical tunes, each prefaced by a 5-second rendition of the tune played by a cellular phone. As the performance was concluding, a cellphone rang loudly. The conductor stopped, turned, and shot a dirty look at the audience. Part of the performance, of course.

Canadian (http:// www.cellphonescanner.com/) actually streams Ottawa-area cellular telephone conversations over the Internet. The site claims it is done to educate people that their analog signals can be overheard. To its credit the site does provide a link to Canadian telecommunication law (http://www.crtc.gc.ca/ENG/ LEGAL/TELECOME.HTM) which appears to be silent on the subject other than to say it's illegal to profit from what one overhears.

#### United Patriot Radio Announces ORT

On the militia watchdog list Tom Sevart of Kansas found a June 15 public statement from Steve Anderson, the driving force behind United Patriot Radio. It appears that United Patriot Radio has left the air, bringing the history of the longest-running domestic United States shortwave clandestine to a close. Following are excerpts from the announcement.

"June 15, 2001, 13:04: It is with regret that I must announce the demise of United Patriot Radio. Last night was my final transmission.

"The reasons for this are ongoing. I am not being intimidated off the air, but starved out. I have put up a good "front" to keep up morale among the people. It ain't workin'! I have needed at least \$2000 per month to get by, and have gotten less than 500. It is the poorest of the patriots that have given the most! I can not continue in this manner. It is not fair to them, or to me.

"I am going to return to what I have done all my life. WORK. I have wasted enough time trying to help the sleeple. I will put my efforts into building a strike team in my area to "take care of business" when it hits. I still may get raided, as the ATF is training hard at Fort Knox just for this, I have been informed" ... Steve Anderson

Some version of this station broadcast with a virtually daily schedule for over three months. The patriot clandestine has come and gone before, with reactivations taking place before too long.

Prior to the Anderson statement, the station was broadcasting fairly regularly and exclusively in June on 6900 kHz upper sideband. The last broadcast of the station to date has been the June 15 UTC broadcast mentioned in the Steve Anderson statement.

The day after the Anderson statement, veteran ACE member Joe Filipkowski in Rhode Island reported an apparent pirate parody of the patriot clandestine on 6900 kHz about 2145 UTC, using an ID of "Bill's Militia Movement."

"Taking all of this together, it would not surprise me if we have not quite seen the end of this remarkable station," says George Zeller, who forwarded the above information. Stay tuned.

Communications is compiled by editor Rachel Baughn, from news clippings and emails submitted by our readers. Thanks to this month's reporters: Anonymous, Albany, NY; Bob Fraser, Cohasset, MA; Malcolm Fisher, Lake in the Hills, IL; Harvey Graves, Akron, OH; Ken Hydeman, Xenia, OH; Sterling Marcher, La Mirada, CA; Thomas Risher, Perris, CA; Doug Robertson, Oxnard, CA; Richard Sklar, Seattle, WA; Sue Wilden, Noblesville, IN. Via email: Howard Bailen, Kevin Carey, Chanel Cordell, Roger Cravens, Ed Cummings, Robert Felton, Scott Heath, Maryanne Kehoe, Ron Martin, Eddie Muro, Scott Townell, Larry Van Horn, George Zeller





## **Folsom State Prison:** How radio is used behind bars

By John Maky AC5ZX

ccording to the California Code of Regulations, maintaining the safety and security of the institution are the primary functions of being a Correctional Officer. However, in reality, the job is much more diverse.

Running a correctional institution is not unlike the running of a small city. Day-to-day activities as simple as providing inmates haircuts must be monitored by custody staff. Even counting the numbers of bars on an oven rack becomes daily routine. A missing bar could be broken down into a stabbing weapon in no time at all by a determined inmate. In short, anything inside the prison that can be used for escape or as a weapon must be strictly accounted for. Above all; the safety of staff is of utmost concern. This is where radios come into play.

There is no way in an article of this size to totally explain the complexity of running a prison. Ninety percent of what you see on TV is a fantasy. I believe the best way to describe how Folsom's radio system (or any California institution, for that matter) is used, is to relate to you a true story of a day as a Correctional Officer.

#### 7:30am

My assignment is serving as one of the two Gun Officers (callsigns "2A" and "2B") inside of "Old" Folsom Housing Unit 2\*. Unit 2 houses hundreds of maximum security inmates, and dates from the mid-1800s. My partner and I arrive through a series of "catwalks" - corridors that deny inmates access to the only two officers that carry firearms inside the cell block. We relieve the two night officers by each taking possession of an H&K 9mm rifle, a S&W .38 special, a "Personal Alarm" (which I'll explain later) and a Motorola 800 MHz trunked radio. The morning meal is already in progress.

Immediately, I am in radio communication with the Kitchen Sergeant. He relays to me just how many inmates he wants released for chow, so the line does not back up. Both my partner and I coordinate this release with the other cell block officers (who are only armed with a baton and their wits) and we keep a close watch on them for their safety. Inmates are provided ten minutes to eat, and then are returned to their cells.

Coordinating inmate "movement" within the housing units via radio is crucial to isolating violence. Once one level is locked up, another one is released. Even so, there are an incredible amount of inmates moving around as the cell block contains twice the number of inmates for which it was designed.

#### 8:00am

Work release. All inmates that are assigned a job are released. There are workers for the license plate factory, kitchen, yard, and clerks. Approximately 85% of the inmates inside Unit 2 are employed. The inmates remaining generally either have the day off, or have been given a pass, known as a "ducat" for medical, dental, or consular appointments. Once work release is completed, the cell block officers check the alibis of inmates not locked up.

#### 8:20am

Without warning, Central Control (the nerve center of any prison) announces on the radio "Personal Alarm - Unit 4 - Freeze all inmate traffic!"

Throughout the institution, when an alarm sounds, all inmate movement ceases. Gates are closed, and no foot traffic will resume until everything is under control. Seemingly from nowhere, officers and custody staff appear running towards the alarm. It is in response to a Sergeant being struck by a combative inmate in the adjoining cell block. The inmate is subdued by responding staff and is taken to be medically checked. I am called on the radio to clear the corridor for the restrained but still hostile – inmate.

Personal Alarm boxes are carried by most staff, and are a transmitter inside a small box. Similar to a garage door opener; each one has a unique code for the employee's work area. When activated, receivers mounted on the ceilings of the workplace will trigger both an audible alarm and show on an annunciator panel inside Central Control. In these situations, custody staff utilize the radio in order to gain additional help, and to summon medical assistance if needed.

Once the incident is contained, a supervisor will announce a "Code 4" and reset the alarm receiver with a key. Fortunately, neither the Sergeant nor responding staff were hurt during the confrontation.

#### 9:00am

Yard time. To help avert the possibility of violence, not all inmates are allowed outside on the main exercise yard at the same time. Schedules are rotated so some inmates go to yard in the morning, and some in the afternoon. The Yard Sergeant calls me on the radio to relay to the building staff to commence our release. There is some routine radio chatter from various yard gun towers to check on suspicious inmate activity.

I advise the yard staff on the radio when our cell block completes its release. Once the release is complete, the remaining men are given the opportunity to shower. This is also the time when building staff have an opportunity to search cells for weapons and contraband.

#### 11:30am

Yard recall. All inmates are returned to the housing units. This is a critical time for both my partner and I. as several hundred inmates from two cell blocks suddenly converge into the unit. For their safety, both of us have to be especially attentive to the location of the building staff. We also have to watch the flow of inmates, as this is a period where weapons are frequently passed and violence occurs.

Once recall is complete, staff climb the five levels, or "tiers" inside the unit to lock the men up. At various places inside the institution, the close-custody count is announced over the radio to account for the inmates that are judged to be the most likely escape risks. This is a quiet period inside the unit, allowing officers time to complete

#### **Folsom Prison Frequencies**

Both "Old" and "New" Folsom Trunked System WNDV910

856.4375 (811.4375 input)\*

857.4375 (812.4375 input)\*

858.2625 (813.2625 input)

859.2625 (814.2625 input)

860.2625 (815.2625 input)

\* It should be noted that most other California prisons utilize both 856.2625 and 857.2625 in lieu of this pair, which is a standardized state-wide frequency plan for CDC.

#### **Folsom Transportation Unit**

In addition to the institutional radio, the California Highway Patrol "Blue" channel (42.180M/42.340B) is used. (Folsom callsign KMA960) California Department of Corrections transportation units will identify as 5800 series numbers on CHP channels.

#### **Folsom Prison Fire Department**

154.235 (simplex)

## **California Law Enforcement Radio**

155.070 (159.030 input) Wolf Mountain CLERS repeater. Seldom used by Folsom Prison; it is only utilized during escapes and major incidents when other agencies are involved.



Aerial view of Folsom and aerial view of "new Folsom" prison courtesy CDC

their paperwork and eat lunch.

#### 1:00pm

Yard time once again. Now the other half of the building population is allowed to go to yard. Like the earlier release, this is coordinated over the radio with the yard staff. Yard time is also when inmates are also allowed to go to the canteen to purchase items. This often leads to much radio chatter, with yard staff maintaining order at what inmates call "The Store." Officers on the yard are also heard using the radio to keep tabs on various gang activity taking place. Intelligence on gangs is collected because knowing "who's-who" is often vitally important in maintaining order.

#### 2:30pm

It is yard recall, and once again we have the sudden influx of men; which now also includes some inmates returning from their work assigna a mata

This time there is an eerie feeling inside the housing unit; one that often precedes violence. This feeling is difficult to explain to anyone who has not worked inside a correctional institution, but is somewhat a sixth sense. After scanning the returning horde, I notice something happening on the fourth tier. One inmate has another down by the hair and is pummeling his head into the concrete.

I shout the order "Get Down" in which hundreds of inmates instinctively hit the floor – all except the assailant. I chamber a round into my rifle, and fire it into the ceiling as a warning shot. My partner shouts into the radio "Shots Fired – Unit Two" and triggers his personal alarm. His call creates a flood of traffic on the radio.

The assailant immediately hits the floor, knowing what will come next. Responding staff

place him into restraints and summon medical aid for the victim. Soon the Watch Commander and Investigations people arrive to preserve the crime scene. This occurs just as if it happened on the streets.

Supervisors are on the radio summoning staff to lock up the inmates not involved in the incident. I clear my weapon; and as the adrenaline wears off, I realize that I am NOT going home at 3:30 as planned. Long after the institution returns to a normal program, I am still there writing reports. The resulting investigation determines the incident was not gang related, but never turns up a reason for the assault.

This, admittedly, is more than you will hear on the average day. Sometimes working in – or monitoring – a correctional institution can be a boring routine. But if you live within radio range of one, keep their frequencies in your scanner. You will often hear the same gut-wrenching, adrenaline-filled communications that you hear from agencies on the street. Also, despite the bad publicity "guards" get, you will often hear heroics enacted by the Correctional Officers that make up a professional team working "The Toughest Beat in the State."

#### **About the author:**

After leaving the Coast Guard, John became a California State Correctional Officer. Besides working at Folsom, he was also assigned to Soledad and Centinela state prisons. He is now retired, and lives in Arkansas.

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## The Scanning's Great in the Granite State

By John Mayson

magine a place where the VHF low band is still alive, UHF hardly used, and trunking an oddity. Such a place is nestled in New England. It's the state of New Hampshire.

New Hampshirites are proud of their Yankee stubbornness. 9-1-1 emergency dialing has just recently been introduced statewide, something the rest of the country has had for two decades, if not longer. It's also the lone holdout in the nation for requiring seat belt usage. It's not that the people of New Hampshire are backwards; they just enjoy doing things their own way. "Live Free or Die" means something here.

However, New Hampshire is slowly migrating to new communications technology. The State Police have vacated their low-band frequencies for a digital VHF system. Nashua will implement a digital trunked system. Manchester and Goffstown already operate their own analog EDACS systems. But, by and large, a bulk of the public safety communications in the Granite State can be monitored with the simplest of scanners.

#### **Communications Structure**

New Hampshire is comprised of ten counties. Ordinarily I like to organize frequency lists and scanning articles by county, but in New Hampshire's case, this doesn't make the most sense. Dispatch centers often dispatch for cities and towns in more than one county and in some cases, more than one state.

Every sheriff's office in the state shares the same frequencies for channels one and two.

Frequency	Channel	Description
156.090	1	State Police to towns
155.475	2	Nationwide

#### **Capital Area**

The Capital Area Fire Mutual Aid (CAFMA) dispatch center is located in the state capital of Concord. It dispatches for communities in the Merrimack County area.

#### **Fire Communications**

Frequency	Channel	Description
154.355	1	Dispatch
154.235	2	Fireground
154.220	3	Fireground
154.280	4	Statewide
158.760		Hooksett Dispatch
154.250		Weare Dispatch
154.160		New Boston Dispatch

50	Allenstown F
51	Boscawen FD
52	Bow FD
82	Bradford FD
53	Canterbury F
54	Chichester FI
55	Concord FD
56	Epsom FD

Agency

5/	Dunbarton FL
58	Henniker FD
59	Hillshorough

63 Hooksett FD

60 Hopkinton FD 61 Loudon FD

76 New Boston FD

71 Northwood FD 62 Pembroke FD

64 Penacook FD 72 Pittsfield FD

72 Pittsfield FD74 Salisbury FD

80 Warner FD

75 Weare FD65 Webster FD

66 Central New Hampshire Hazmat Squad

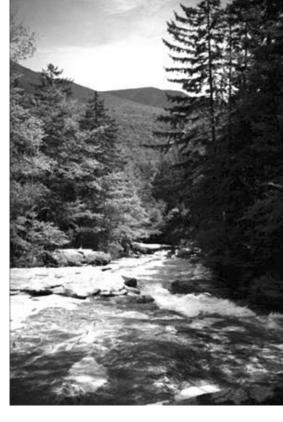
79 Tri-Town Ambulance

### Law Enforcement Communications Frequency Channel Description

155.685	3	Merrimack County SO
155.625	4	Concord PD Primary
155.820	5	Concord PD Secondary

#### **Lakes Region**

The Lakes Region attracts tourists from around New England. Lake Winnipesaukee of-



fers swimming, water skiing, sailing, and other aquatic activities. Be sure to monitor maritime frequencies such as 156.800 MHz if you find yourself in the Laconia area.

The Lakes Region Mutual Fire Association (LRMFA) dispatch center is located in Laconia, in the central part of the state. DXers are familiar with LRMFA due to the fact their low-band dispatches often skip across the continent.

#### **Fire Communications**

Frequency	Channel	Description		
33.90 1	Dispatch			
33.962	Fireground			
33.843	Fireground			
33.764	Fireground			
33.48 5	Mobiles			
33.54 6	Mobiles			

#### ID Agency

30 Alexandria FD

1 Alton FD

31 Andover FD

2 Ashland FD

6 Barnstead FD

3 Belmont FD

34 Bridgewater FD

4 Bristol FD

35 Campton-Thornton FD



LRMFA console

49	Care-Plus Ambulance
5	Center Harbor FD
66	Central New Hampshire Hazmat Team
36	Danbury FD
32	East Andover FD
7	Franklin FD
8	Gilford FD
9	Gilmanton FD
37	Hebron-Groton FD
11	Hill FD
12	Holderness FD
13	Laconia FD
14	Meredith FD
15	Moultonboro FD
16	New Durham FD
17	New Hampton FD
18	Plymouth FD
38	Rumney FD
19	Sanbornton FD
20	Sandwich FD
45	Stewarts Ambulance Service
25	Strafford FD
21	Tilton-Northfield
44	Twin Rivers Ambulance
40	Warren FD
24	Warren-Wentworth EMS
23	Waterville Valley FD
41	Wentworth FD
22	Winnisquam Fire District
00	WILL ED

Stratford FD	154.445	14	155.760	Redstone Village FD
Whitefield FD	155.115	6	154.175	Tamworth FD
		10	154.175	Tuftonboro FD
Law Enforce	ment Communications	8	154.175	Wakefield FD
Agency	Frequency	7	154.175	West Ossipee FD
Countywide Dispatch	155.595	9	154.250	Wolfeboro FD

#### **Ossipee Valley**

The White Mountains National Forest, the Presidential Mountains, and famous Mount Washington are all found here. The Ossipee Valley Fire Mutual Aid (OVFMA) dispatch center is located in the Carroll County Sheriff's Office.

#### **Fire Communications**

Fir	Fire Communications		
ID	Frequency	Agency	
20	154.145	Bartlett FD	
23	154.145	Bartlett-Jackson EMS	
11	155.760	Center Conway FD	
1	154.175	Center Ossipee FD	
12	155.760	Conway Village FD	
13	155.760	East Conway FD	
2	154.175	Effingham FD	
3	154.175	Freedom FD	
21	154.145	Glen Village FD	
22	154.145	Jackson FD	
4	154.175	Madison FD	
18	154.325	Milton FD	
15	155.760	North Conway FD	
5	154 175	Ossinee Corner FD	

#### Law Enforcement Communications

Frequency Description

154.860 Carroll County SO Primary 155.535 Carroll County SO Secondary

#### **Seacoast**

The Seacoast Fire Net is responsible for dispatching all of the towns in coastal Rockingham County. It also dispatches for some towns in neighboring counties, including York County, Maine and Essex County, Massachusetts.

Description
Seacoast Dispatch
Statewide Fireground
Secondary
Portsmouth Naval Shipyard

## Souhegan Valley Fire Mutual Aid Association

The Souhegan Valley comprises much of southwestern Hillsborough County, New

Visit http://www.lrmfa.org for more information about this agency.

#### **Law Enforcement Communications**

Law Emorcement Communic		
Frequency	Description	
155.790	Laconia PD Primary	
155.010	Laconia PD Secondary	
155.640	Laconia PD to Conway PD	
154.830	Belknap County SO Primary	
154.085	Belknap County SO Secondary	
854.4875	NH Marine Patrol	

#### **Northpack**

Wolfeboro FD

Coos County is the northernmost county in New Hampshire. The towns in this part of the state operate a system known as Northpack. Winter comes early to these parts, but the rugged residents of one small hamlet make sure they're the first in the nation to vote. Polls open at 12:01a.m. on Election Day in Dixville Notch.

#### **Fire Communications**

Agency	Frequency
Berlin FD	154.130
Bethlehem FD	154.235
Colebrook FD	154.340
Dalton FD	155.145
Dixville FD	154.340
Erroll FD	155.940
Gorham FD	155.880
Groveton FD	154.445
Jefferson FD	154.355
Lancaster FD	154.445
Milan FD	154.445
Northumberland FD	154.445
North Stratford FD	154.445
Pittsburg FD	154.355
Randolph FD	155.085
Shelburne FD	155.115
Stark FD	154.980
Stewartstown FD	154.355





#### Mount Washington Hotel

Hampshire's most populous county. Included in this area is the Milford Area Communications Commission Base (MACC-Base), the city of Goffstown which operates its own VHF EDACS system, and the city of Manchester, which operates its own 800 MHz EDACS system.

ID	Agency	Frequency
1	Amherst FD	33.64
3	Bedford FD	33.78
5	Brookline FD	453.3625
8	Goffstown FD	158.880
10	Greenville FD	33.64
13	Hollis FD	33.64
14	Hudson FD	153.950
15	Litchfield FD	154.190
16	Lyndeboro FD	33.64
17	Manchester FD	460.625 & TRS
18	Mason FD	33.74
19	Merrimack FD	153.980
20	Milford FD	33.64
21	Mount Vernon FD	33.64
22	Nashua FD	151.250
24	New Ipswich FD	154.430
28	Temple FD	154.430
30	Wilton FD	33.64
75	Weare FD	154.160 & CAFMA
76	New Boston FD	33.78 & CAFMA

#### **MACC-Base**

Cnan	rrequency
1	33.64
•	00 (0

1	33.64
2	33.68
3	33.88
4	39.90

#### **Law Enforcement Communications**

Description	Frequency
Hillsborough County SO	155.520
Hillsborough County SO Primary	155.430
Amherst PD	154.875
Antrim PD	155.760
Bedford PD	155.310
Bennington PD	155.760
Deering PD	155.370
Francestown PD	155.640
Greenfield PD	155.640
Greenville PD	155.490
Hancock PD	155.640
Hillsborough PD	155.760
Hollis PD	153.785
Hudson PD	460.425
Litchfield PD	154.905
Lyndeborough PD	154.875
Mason PD	155.490
Merrimack PD	155.550
Milford PD	154.875

Mount Vernon PD	154.875
	460.200
Nashua PD	
New Boston PD	154.055
New Ipswich PD	155.565
Pelham PD	154.770
Peterborough PD	155.640
Sharon PD	155.640
Temple PD	155.490
Weare PD	158.850
Wilton PD	154.875
Windsor PD	155.760

In addition, Manchester and Goffstown operate the state's only two public safety trunked radio systems. Nashua's ASTRO system will be online soon.

#### **Goffstown TRS**

## EDACS analog

rrequencies	Ц
170.150	1
159.840	2
160.305	3
159.360	4
160.485	5

The Goffstown PD uses two talkgroups on this system.

AFS	Description
04-081	GPD Primary
04-082	GPD Secondary

#### **Manchester TRS**

#### **EDACS** analog Frequencies ICN

riequelicies	LUI
856.2125	1
856.4875	2
857.4875	3
858.4875	4
859.4875	5
860.4875	6
855.4875	7
855.7125	8
855.7375	9
855.9625	10
855.9875	11

Most city agencies now use the trunked system.

#### AFS Series Description

01-xxx Manchester PD 02-xxx Highway Department 07-xxx Civil Defense 08-xxx Parks 11-xxx Fire/EMS

If you would like more specific information on the Manchester system, visit http://www.trunkedradio.net.

#### **Southwestern New Hampshire District Fire Mutual Aid**

The Southwestern New Hampshire District Fire Mutual Aid System is responsible for answering and dispatching emergency calls for Deerfield Valley Rescue as well as 17 other ambulance services, 78 fire departments, and 26 police departments in 78 member towns throughout New Hampshire, Vermont, and Massachusetts.

The dispatch center, located within the Keene Fire Department, is staffed 24 hours a day by 10 full-time and 7 part-time Communication Specialists. Many of the dispatchers are also members of the area ambulance services. rescue squads, fire departments, and police departments they dispatch for.

Deerfield Valley Rescue is dispatched on their own radio frequency of 155.265. The base radio call sign is KDX768 and the ambulances are called DV1, DV2, DV3, and DV4. Deerfield Valley Rescue can also communicate on Mutual Aid's main fire dispatch frequency, 154.430, and the Deerfield Valley Fire Mutual Aid System frequency, 154.010. The ambulances also have two hospital frequencies called HEAR 1 and HEAR 2.

The mutual aid system uses transmitters located in the following cities and towns: Alstead, NH, Dublin, NH, Keene, NH, Gilsum, NH, Greenfield, NH, Lempster, NH, Newfane, VT, Peterborough, NH, Stratton, VT, Temple Mount, NH, Westmoreland, NH, Wilmington, VT, and Winchester, NH.

#### Fire Frequencies

154.430	Dispatch
33.780	Dispatch
33.540	Dispatch .
154.445	Dispatch
154.385	Tactical 1
154.280	Tactical 2
154.830	Tactical 3
154.010	Tactical 4
154.295	Tactical 5

#### ID Agency

46	Acwort

1 Alstead

2 Antrim

52 Bellows Falls, VT

Bennington

5 Brattleboro

54 Charlestown

55 Chester, VT

6 Chesterfield 56 Claremont

Dublin

Dummerston, VT





	ICOM		P	ALST
PCR100	RCV 44	\$249.95	R30	RCV
PCR1000	RCV 45	\$349.95	R30 w/Collins filter	RCV
R75	RCV 32	\$574.95		
R8500	RCV 14	\$1469.95*	AN	ITEN
	SONY		AOR SA7000 Super-wid	
ICF-2010	RCV 2	\$349.95	Active Duck	J
ICF-SW77	RCV 2 RCV 10	\$469.95	Grove Skywire	
ICF-SW7600GR	RCV 1	\$174.95	H800 Skymatch Active	
		457.132	Select-A-Tenna	
	AOR		Super Select-A-Tenna	
AR-5000 Plus 3	RCV 42P	\$2120.05*	Sony AN-LP1	
AR-7030 Plus	RCV 42P RCV 17	\$2139.95* \$1499.95*	WiNRADiO AX-31B	4
AK-7030 I lus	RC V 17	\$1499.93	WiNRADiO Antenna Dis Unit 3 in/6 out	stribution
SA	ANGEAN		WiNRADiO Antenna Dis	tribution
		<b>*</b>	Unit 4 in/8 out	stribution
ATS-505	RCV 4	\$129.95	Olife i ili/o oue	
$\mathbf{W}$	iNRADiO		ACC	CESSO
WR-1550 (External)	RCV 47-E	\$549.95	ICOM RECEIVERS	
WR-1550 (Internal)	RCV 47-I	\$499.95	UT-106 DSP upgrade kit	
WR-3150 (External)	RCV 48-E	\$1849.95	Remote control software for OPC-131 DC Power Cord	R75
WR-3150 (Internal)	RCV 48-I	\$1849.95	OPC-131 DC Power Cold	
WR-3500 (External)	RCV 49-E	\$2395.95	SONY RECEIVERS	
WR-3500 (Internal)	RCV 49-I	\$2395.95	AC adaptor for SW7600G	
WR-3700 (External)	RCV 50-E	\$2895.95	AOR RECEIVERS	
WR-3700 (Internal)	RCV 50-I	\$2895.95	CTCSS for AR5000 & AR50	000+3
G	RUNDIG		Winradio receivers	
Satellit 800	RCV 33	\$499.95	FSK decoder Portable power supply	
Yacht Boy 400 PE	RCV 33 RCV 22	\$184.95	Digital Suite software	
Tacht Boy 400 I E	RC V 22	ψ10 <del>1</del> .73	Database Manager software	
	DRAKE		Trunking Software	Codolo
R8-B	RCV 3	\$1349.00	USB Adaptor for External M Telephone Interface for Exte	
			DRAKE RECEIVERS	
JAPAN KA	ADIO COMI	PANY	VHF converter	
NRD-545	RCV 21	\$1799.95	External Speaker	
	GE		JRC RECEIVERS	allular)
SUPERADIO III	RCV 5	\$59.95	Wide-band converter (less converted High stability crystal	enular)
			MISCELLANEOUS	
	YAESU		Scancat Gold for Windows	NT 11
VR5000	RCV51	\$899.95	Scancat Gold for Windows S Speco Speaker	on Opgrade
			Speed Speaker	

### Shipping/Handling Charges

Total Order	<b>Shipping Charges</b>
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\$100-\$399	\$7.95
\$400-\$899	\$11.95
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\$2000-\$2499	\$23.95
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\*price includes shipping within the US Prices subject to change without notice.

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Unit 3 in/6 out	ANT 37	\$9,799.95
WiNRADiO Antenna Distribution		
Unit 4 in/8 out	ANT 38	\$11,799.95
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Remote control software for R75	SFT 24	\$79.95
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Portable power supply Digital Suite software	PWR 5 SFT 15	\$189.95 \$85.00
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Trunking Software	SFT 23	\$89.95
USB Adaptor for External Models	ACC2	\$49.95
Telephone Interface for External Models	ACC6	\$1995.00
DRAKE RECEIVERS		
VHF converter	ACC 43	\$249.00
External Speaker	SPK2	+ \$65 installation \$48.95
External Speaker	SFK2	p46.93

RCV 18

RCV 18C

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ACC 11 ACC 12

SFT 2W

SFT 2SE

SPK1

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\$99.95

\$59.95 \$19.95



- 48 East Dover
- 27 East Swanzey
- 10 Fitzwilliam
- 37 Francestown
- 12 Gilsum
- 77 Goshen
- Grafton, VT 58
- 13 Greenfield
- 90 Guilford, VT
- 91 Halifax, VT
- 14 Hancock
- Harrisville 15
- 18 Hinsdale
- Jaffrey 16
- 47 Jamaica, VT
- 19 Keene
- 17 Langdon
- 76 Lempster
- 120 Londonderry
- Marlboro, VT 44 20 Marlborough
- 21 Marlow
- 11 Meadowood
- 3 Nelson
- 22 New Ipswich
- 23 Newbrook, VT
- 45 North Walpole
- 122 Peru. VT
- 24 Peterborough
- 38 Putney
- 92 Readsboro, VT
- 25 Richmond
- 26 Rindge
- Rockingham, VT 66
- 57 Roxbury
- Saxtons River, VT 62
- 121 South Londonderry
- 29 Spofford
- 63 Springfield, VT
- 31 Stoddard
- 125 Stratton, VT
- 32 Sullivan
- 30 Surry
- 28 Swanzey Center
- 50 Temple
- 33 Townsend, VT
- 34 Troy
- 75 Unity
- 41T Vernon, VT
- 35 Walpole

- Wardsboro, VT
- 86 Washington
- 7 West Chesterfield
- 93 West Dover, VT
- 43 West Swanzey
- 42 Westminster, VT
- 36 Westmoreland
- 123 Weston, VT
- 94 Whitingham, VT
- 41 Williamsville
- 95 Wilmington, VT
- Winchendon, MA 39
- 40 Winchester
- 126 Windham, VT 124 Winhall, VT
- **Law Enforcement Communications**

### Frequency Description

155.070 Cheshire County SO Primary 155.640 Cheshire County towns PD Primary

155.250 Keene PD Primary

#### **EMS Frequencies**

LING	requen
155.220	Dispatch
155.265	Dispatch
155.340	Medical 1
155.280	Medical 2
155 175	Medical 3

Visit http://www.firemutualaid.com/ for more information about this system.

#### Twin State Fire Mutual Aid System

The Twin State Fire Mutual Aid System is located in the Grafton County Sheriff's Office and dispatches for towns in New Hampshire's Grafton County and Vermont's Caledonia County.

Frequency	Description
154.400	Primary
154.295	Fireground

#### **Upper Valley Mutual Aid** System

The Upper Valley Mutual Aid System is responsible for dispatching along the Connecticut River for towns in both New Hampshire and Vermont.

#### **Fire Communications**

Frequency	Description
154.130	Primary
153.950	Secondary
154.280	Statewide Fireground
154.400	Twin State Mutual Ai

#### **Law Enforcement Communications**

Frequency	Description
154.770	Grafton County SO Primary
154.755	Plymouth PD Primary
155.310	Littleton PD Primary

#### **Key to Abbreviations**

AFS	Agency-Fleet-Subfleet
CAFMA	Capital Area Fire Mutual Aid
EDACS	Enhanced Digital Access Communications System
EMS	Emergency medical service
FD	Fire Department
Hazmat	Hazardous materials
LCN	Logical Channel Number
LRMFA	Lakes Region Mutual Fire Association
MACC-Base	Milford Area Communications Commission Base
OVFMA	Ossipee Valley Fire Mutual Aid
PD	Police Depatrmant
SO	Sheriffs Office
TRS	Trunked Radio System



Lakes Region Mutual Fire Aid (LRMFA) communications center

## ACARS Message Decoding and the AIRNAV 3.0 Program

By Jean Baker

oday, monitoring the VHF and HF aero bands involves a lot more than just sitting around and listening, and perhaps keeping a written log of what you hear. In this feature, we are going to look at two activities to enhance your enjoyment of our hobby: decoding and using ACARS messages, and real-time aeronautical tracking using AirNav products.

#### Decoding ACARS Messages

Before we go into the how-to area, let's look at some basic information. "ACARS" is an acronym for Aircraft Communications Addressing and Reporting System. This is a digital data link system transmitted via VHF radio, which allows airline company flight operations to communicate with the various aircraft in their fleet.

This VHF digital transmission system was developed by ARINC (Aeronautical Radio, Inc.), back in the late 1970s in response to the heavy voice traffic on the 128.825 – 132.000 VHF band. Instead of giving OOOI (Off, Out, On, In) reports, passenger loads, catering requests, service requests, and other rather routine items by voice, these are now transmitted by ACARS as down-

loaded messages, and anything requested by the company can be uploaded by them to the aircraft. This also has the advantage of taking a lot of the voice traffic off the VHF company frequencies and leaving them open for those airlines not ACARS equipped, or for those whose ACARS equipment may be out of service.

Components of the ACARS System:

- 1. The Airborne Subsystem, which is onboard the aircraft and consists of a Management Unit (which receives ground-to-air messages via the VHF radio transceiver and controls the replies. The Control Unit is the aircrew interface with the ACARS System, consisting of a display screen and printer).
- 2. The ARINC Ground System consists of all the ARINC ACARS remote transmitting/receiving stations, and the ARINC computer and switching systems.
- **3.** The Air Carrier C2 (Command and Control) and Management Subsystem is basically all the ground-based airline operations, such as operations control, maintenance, crew scheduling and the like, that are linked up with that ACARS System.

Downlinks are those ACARS transmissions that originate in the aircraft, and Uplinks are those messages sent from the ground station to the aircraft. A typical series of ACARS transmissions will look something like this example from United 767-300 ERs departing from Washington Dulles International (IAD):

ACARS mode: 2 Aircraft reg: .N651 UA
Message Label: QF Block id: 1 Msg no: M82A
Flight id: UA0978
Message content: IAD2241FRA

-05/08/1997

The label **QF** refers to an ACARS OFF report/message. The nose gear struts are now retracting and the ACARS System duly notes this event as the off time (**2241**). Departure Airport and Destination are noted to the left and right of the OFF time respectively.

Here's another example: This time we see a downlink response to an uplink weather report sent by crew request or automatically by the flight operations:

In the following two messages, we see a takeoff (TO) engine performance report.

ACARS mode: 2 Aircraft reg: .N651UA

Message label: H1 Block id: 3 Msg. no:D89A

Flight id UA 0978

Message content:

#DFBE13C24651 ????????8 5972240T0

132202 294 25103269 220

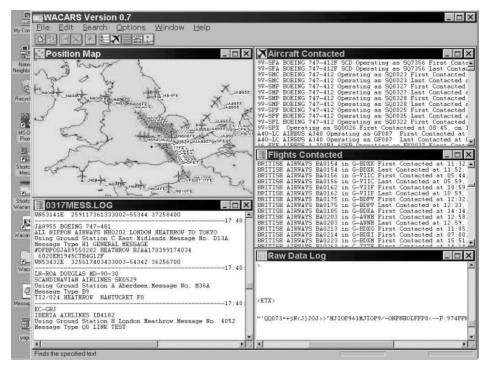
1440 947 520 97418600250107179

5341565144173014923812143

262528 11 021

[05/08/1997 22:42

ACARS mode: 2 Aircraft reg: .N651UA Message label: H1 Block id: 4 Msg. no: D89B Flight id: UA0978 Message Content:-#DFB89 0 0 0 661147 47



A6F003980000080000D2A00000000000000000000002A3

B4F4039C8000080000D2A00000000000000000000002A3

The following message is a downlink response to an up linked HOWGOZIT report (shown next), which is a United Airlines flight data report format:

ACARS mode: 2 Aircraft reg: .N651UA Message label: 5Z Block id: 7 Msg. no: M83A Flight id: UA978 Message content:-/R3 IADFRA 0978-5 IAD

—[05/08/1997 22:44

ACARS mode:2 Aircraft reg: .N658UA
Message label: RA Block id: J Msg. no: QUHD
flight id: QWDUA ~
Message content:10978-23 HOWGOZIT
UA978 IADFRA (Dulles/Frankfurt-jb)
IAD 2214/2249 887A
SWANN 2259 37 849
BROSS 2301 37 849
ODD 2307 37 815
RBV 2312 37 801
ACK 2337 37 757
WHALE 2354 37 728
BANCS 0108 37

- [23/071997 22:511

Waypoints are shown in the left hand column, just below the OUT and OFF times from IAD. Out refers to doors closing on the aircraft at the gate, and OFF refers to time of departure as outlined above. ETAs (estimated times of arrival) at the waypoints along the route are shown in the middle column, requested/expected flight level next and fuel remaining figures are shown in the right hand column.

Okay, now that we have gone over a few of the basics, let us go into a bit more detail on message decoding. By the way, let me assure you that it is perfectly legal to do so.

#### Software and Hardware for Decoding

First, let's look at what you'll need to be able to decode ACARS messages: A VHF scanner that receives the aero communications band (118.000 - 136.975) comes first. If you plan to use software that enables your computer/sound card to do the decoding, you'll need an audio cable to go between the scanner's recorder or phone outlet and the computer's sound card (LINE IN/AUX). A Sound Blaster sound card seems to bring about the best results, but others also work successfully. A hint: If plugging the audio cable into the sound card does not work, try plugging it into the computer mic outlet. I had no luck whatsoever using the sound card outlet and was about ready to give up when I decided to try the mic. Bingo!

It's a good idea to put your scanner as far away from your computer as possible to avoid computer interference. No matter how up-todate your computer may be, there's still RF emanating from it. Okay, so you've got everything ready to go, but wait! You still need software for the actual decoding. Let's take a look at what's available:

I've found that the freeware decoders are great for those just starting out in learning to decode ACARS messages; we'll mention some of the commercial ones as well a bit later in this article.

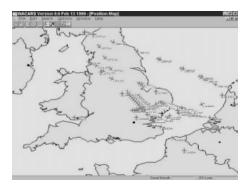
#### KRACARS:

This freeware program was written by Khalid Rafiq (http://www.tardis.ed.ac.uk./~kr/) back in August of 1977. It has not been updated since then, but is still a very popular program. Incidentally, it is a DOS program (still remember how to use DOS?). To use this software, the author lists the following requirements:

- PC with at least 1 M Byte RAM.
- DOS (any later version is acceptable, I've found)
- SoundBlaster sound card or compatibles
- Scanner receiver with audio cable for connection to be established.
- **KRACARS** will also work from within Windows 95 as a DOS application.
- KRACARS is an excellent program and it does
  a fine job of decoding ACARS messages;
  not only that, it's easy to use and fun, too!

#### WACARS:

Here is another freeware program; this one was written by Michael Roberts (http://www.geocities.com/CapeCanaveral/Cockpit/



**9870/acars.html** ). **WACARS** is a Windows program.

I've tried this program also, and have both **KRACARS** and **WACARS** on my computer. Be advised, however, that while **WACARS** may be a more sophisticated program, **KRACARS** is easier to use!

#### **Decoders:**

There is other equipment to consider, such as combination software/decoders from



commercial sources. These usually include an interface which goes between your scanner and computer serial port. The Lowe Airmaster is a good example. Go to <a href="http://www.lowe.co.uk/">http://www.lowe.co.uk/</a> for a look at this equipment. Another one to check out is the Pervisell Company at <a href="http://www.pervisell.com/ham/">http://www.pervisell.com/ham/</a>—they also make a software/decoder. Universal Radio, Inc. <a href="http://www.universal-radio.com">http://www.universal-radio.com</a> has the Universal ACT-1, which is hooked up between your computer and scanner. However, Universal also sells much more sophisticated decoders, which receive many modes, ACARS among them.

Software-only programs such as KRACARS and WACARS can take their data from decoders such as those above as well as directly from scanner audio.

#### Decoding

The next step is to pick a frequency. Listed below are the ACAR frequencies in present usage:

131.550 - Primary Channel worldwide

130.025 - Secondary Channel for USA & Canada

129.125 - Additional Channel for USA & Canada

130.450 - Additional Channel for USA & Canada

131.125 - Additional Channel for USA

136.700 - Additional Channel for USA

136.800 - Additional Channel for USA

131.725 - Primary Channel in Europe

131.525 - European Secondary

131.475 - Air Canada Company Channel

131.459 - Primary channel for Japan

136.900 - European secondary

136.925 - ARINC European Channel

136.850 - SITA Canadian Frequency

Now that you have picked one (try the first one listed above for your first efforts if you live in the USA), turn on your scanner and turn the squelch completely off! You will see a lot of raw data at first if you use WACARS, for instance. Then it should start to form into messages in the message box. You may have to fiddle with the volume control on your PC before data comes in correctly; if the sound is too soft, you won't get much of anything. I found that turning your volume knob on your scanner to halfway up is about right. Watch signal strength and CPU load if you're using WACARS. The indicator should show signal strength mostly in the green; if you see red, your reception is too loud.

For complete information on what all the codes on the messages mean, I suggest you pick up a copy of *Understanding ACARS* by ACARS master Ed Flynn. This can also be obtained through Universal Radio, Inc.

Happy decoding!

#### **Acknowledgements:**

We send our thanks to Tony, Steve, and Nick, who head the web site http://patriot.net/~acars for permission to use some of their very helpful information regarding the ACARS System, and decoding messages. Take a look at their website and tell 'em you saw it in MT!



#### **AirNav Systems Products**

Several months ago, I was "talking" with a friend overseas on ICQ who was an avid AirNav 3.1 user. He did his best to sell me on the product as he was extremely pleased with all facets of the program. I had purchased AirNav Lite previously, but hadn't used it much as my old computer wasn't very reliable and half the time I couldn't download data because it would freeze up. Since I had a new computer, I decided to check out the web site. I was very glad I listened to my friend, as once I read all the specs I was amazed at all of the goodies to be found there!

Although there is a demo version of the software, I was so intrigued by my friend's experience and the myriad of features included, that I went for the real thing right away. I used NavAid's secure system to charge the very nominal one-time cost of \$70.00 to my credit card. Within 1-1/2 hours, I had my codes to deactivate the "demo" specifications of the program, which come in three files.

Of course, I had to start working with the software right away! So, I opened one of the North Atlantic maps and downloaded the data. In about 2 minutes, I had a "sky full of planes"! I found that I got even more out of the program by turning on my HF receiver to one of the frequencies for the area I was visually monitoring!

Not only do you get "real time" action, but updated flight data from the Internet is available. The data you receive when you choose this option is downloaded from a meteorological FTP server that receives flight updates from many ATC centers around the world. This is semi-real time tracking with a minimum delay of only 10 minutes.

Here is a partial list of what you get with AirNav 3.1:

- ACARS, HF, and VHF real time tracking and monitoring
- Internet semi-real time tracking (300 flights/hour worldwide
- Compatible with all ACARS decoders
- Multi-window and vertical tracking
- All heard aircraft management
- Electronic flight progress strips
- Mercator and Azimuthal charts
- Up to 2000 flights simultaneously
- Up to 50 waypoints per flight
- Accurate estimation of times and waypoints
- Professional interface
- Terminal and flight Management modes
- 32 bit application
- 9 updated databases with more than 100,000 records (and these data bases are often updated).
- Seven different map creation methods

- Airspace related data drawing
- New online help, ACARS quick view, Standby Flights
- Six tutorials to help users with most phases of the program
- More than 50 ATC Centers data memorized
- Help file (70 pages +)
- Technical assistance is available via email or can be found on-line.

The ACARS-related part of the program is very simple to use with any of the decoder programs or software/demodulators available. I've used both WACARS and KRACARS with excellent results. There are tutorials to help you get started with ACARS decoding for AirNav 3.1, as well.

If you are an experienced aero comms monitor, you'll love AirNav 3.1 – it's a tool that brings monitoring very close to being in a real control or radio operation facility!

#### **AirNav Internet Lite:**

This is an excellent program for those who may be just starting out in the monitoring hobby, or perhaps are returning to it after a long absence. Just as with AirNav 3.1, there is access to Internet Flight Tracking. Other features include:

- Multi-window tracking
- Electronic Flight Progress strips
- Mercator and Azimuthal charts
- Up to 2000 flights simultaneously
- Up to 50 waypoints per flight
- 32 bit application
- Updated data base with more than 100,000 records
- Airspace-related data drawing
- Online help and manual
- AirNav Internet Lite has a one-time cost of \$64.95 and can also be purchased on-line

#### AirNav SELCAL Decoder:

If you have any interest at all in logging SELCALs – those identifiers which are unique to each aircraft – here is a painless and fun way to do it. Remember the days when you sat there by your receiver with a paper and pencil (no pens: a lot of erasing was involved) and furiously logged all the details of the flights you were monitoring – especially, trying to get the SELCAL letters down in correct order? Well, if you purchase AirNav's program, you'll never have that problem again, as all SELCAL, registration, flight number, airline, etc., details are right on the screen and all records can be printed out as well!

A one-time charge of \$39.95 (also payable on line) buys you this excellent program to go along with your other AirNav software. All you need to enjoy it is a shortwave receiver on which you can tune in the HF aero bands (in other words, it has to have a BFO or USB/LSB con-

trol), a soundcard, and Windows 95 or better. These transmissions are all decoded by the program in real time, incidentally. There is no other hardware or decoding system to buy. This is it! If you are a die-hard SELCAL collector, or even have a passing interest in SELCALs, this is the program for you!

If it seems to you that I'm a big fan of AirNav products, you are right – I am. These programs have produced many hours of enjoyment for me, and they can do the same for you. Take a look at the AirNav web site at http://www.airnavsystems.com - you'll be glad you did!

If you prefer not to purchase over the Internet, you may send your registration to AirNav's internet agent, RegSoft, by postal mail or fax, or you can register over the phone. By telephone ask to order AirNav - The Aircraft Tracking Software for Windows, Version 3.1, or you may write and send a check written to RegSoft to: RegSoft.com, 6595-G Roswell Road, Suite 732, Atlanta, GA 30328. Phone 1-877-REGSOFT (Toll-free), 770-497-9126 (for international orders); FAX 770-497-9234, Email: info@regsoft.com

AirNav is not available in stores, except for Flightdeck, Manchester's Aviation Emporium, in England. For more info visit http://www.flightdeck.co.uk/or call Tel +44 (0) 161-499-9350.

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## "A Diamond in the Sky"

By John Smithson

s a child, I would often watch for the first "star" in the evening sky and recite the poem:

"Twinkle, twinkle, little star...
How I wonder where you are.
Up above the world so high...
Like a diamond in the sky...."

This usually meant the planet Venus...almost motionless in the sky. Then I noticed "stars" that traveled quickly across the sky. The Sputnik and Explorer satellites were first, then followed by a host of others like Skylab, the Russian *Mir* station, and the International Space Station. Now, there are *dozens* of objects in space that can be viewed with the naked eye. These "man made stars" give me the same thrill I experienced as a child when they soar across the night sky. I still wonder "where they are" as the poem says...when I hear of a new one.

The *newest* "diamond in the sky," the *Starshine* satellite, is scheduled for launch on August 31, 2001, from NASA's Kodiak Launch Complex, Alaska. It is a 200 pound aluminum sphere, about three feet diameter, with 1500 small reflective mirrors attached to it and coated with silicon dioxide. School groups from all over the world polished all but 300 of the mirrors.

Starshine was built to the specifications of Gil Moore, project director, by the Naval Research Laboratory, with the assistance of the Calhoun Community College in Decatur, Alabama, and the C.F.P. Paul Rousseau school in



Gil Moore shows the satellite before the mirrors are attached.

Drummondville, Canada. It is a project of many volunteer groups directed by Gil Moore of Monument, Colorado. He has recruited schools from all over the world, procured mirrors and polishing materials, obtained satellite flight opportunities and arranged for tracking orbits and the atmospheric density studies. *Starshine* will ride upon an unmanned Lockheed Martin Athena One Rocket.



Polished mirror

This is the third *Starshine* satellite to be assembled. It will be placed in a 300 mile circular orbit, inclined to the equator by 67 degrees. This means the satellite will be visible at twilight to *all* the children in the world as it orbits the earth for several years. You will be able to *see* the *Starshine 3* satellite at twilight for several years because it will "blink" as the sun reflects off its mirrors. Students from all over the world will calculate its orbit and decay from *visual* observations. All they need is an accurate watch and basic knowledge of the constellations.

I observed the last *Starshine* satellite "twinkle" across the evening sky several times before it deorbited like a flaming comet into the ocean. Skywatching has been a diversion of mine for several years, the result of the ham radio hobby. There is a beacon aboard *Starshine* transmitting on a two meter ham radio VHF radio frequency. Any general coverage scanner will be able to receive its signal. You will be able to detect it on the frequency of 145.825 MHz. This

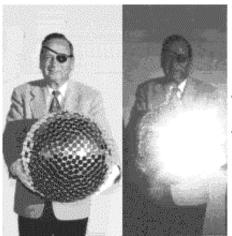
means you can listen to the radio signal (just like the original *Sputnik*), as it crosses the sky.

There will be another *Starshine* satellite (the second assembled) launched from the space shuttle *Endeavor* on November 29, 2001. The internal spin mechanism was reviewed and approved by the NASA Goddard Space Flight Center on January 18, 2001. Progress is being made smoothly for this launch also.

I've watched the International Space Station, the Russian *Mir* station, and the Iridium Communications Satellites (the sun reflecting off their solar panels can be seen even in broad daylight sometimes), the Hubbell Space Telescope, and several spy satellites for years. They are just as fascinating as the "diamond in the sky" I wished upon as a kid. I hope you will be able to see *Starshine* as it passes over your home.

How about inviting the family, or the entire neighborhood outside on a clear night to watch the sky? It's amazing what you can see in the heavens! To learn more about the "Starshine Project" and to participate in its study, you can log onto the *Starshine* web page at http://www.azinet.com/starshine/index.html or send e-mail to *Jspiker@aol.com*.

Skywatching can be a *lifetime* learning experience.



Gil Moore holds a replica of Starshine; photo to right is the sun reflected from just one mirror.



ade C. Langley has been monitoring for over thirty years.

Like many in the hobby, he was drawn toward scanning by an interest in aviation and law enforcement. He recalls riding in the (cockpit) jump seat of a jetliner, thanks to his father's career in the airline industry, and having footingted with the

reer in the airline industry, and being fascinated with the communication and navigation functions of the airplane. "To hear the pilots be told where to fly the plane was just amazing." He was 8 years old at the time.

His first scanner was a
Radio Shack "Patrolman 8" at age
14, stocked with crystals for local
VHF police channels. By age 15 he had joined the City of Coral Gables (Florida)
Police Explorers, and quickly set himself apart from the other "kids" by bringing his scanner on ride-alongs with Officers...and the Officers loved it!

With Wade's scanner, Coral Gables PD could actually listen to adjacent jurisdictions such as the City of Miami PD, City of South Miami PD, and the County's Public Safety Department. This proved extremely beneficial for calls that were on the jurisdictional borders, since the Gables unit could determine which other agencies and units (if any) were enroute.

The scanner was also used for some occasional "police humor," as when a Gables unit would actually respond to a nearby Miami call...without telling the dispatcher, of course...just to harass the Miami Officer about taking so long to get there!

Membership in the Civil Air Patrol followed at age 16, and this opened the gate to the guarded, closed perimeter of Homestead Air Force Base to Wade's curiosity. His dream at the time? A hand-held scanner capable of receiving the military UHF aircraft band along with VHF and UHF land mobile channels.

After high school he enjoyed using a Bearcat 210 with a home-built, D-cell battery box at work, at home and on the road. This afforded him programmability and portability in a briefcase-sized package. Next came a Bearcat 220 to satisfy his con-

tinued interest in aviation. Now armed with a car and a program-

mable scanner, Wade "camped out" for hours at a time...at the Air Force Base, the Federal Building, the county's Civil Defense Center...to mix a little scanning and searching with his college reading and studying.

His handheld milcom scanner was finally produced by Radio Shack, and the world of aerial refueling, NORAD alerts and military war games became readily accessible. "It was so cool to monitor aerial refueling from my house. They [the aircraft] were two miles off the coast and easily heard with a rubber-duckie antenna." Wade also entered local government service in the traffic department, with volunteer communications work at the Civil Defense agency.

#### The Feds meet their match

In 1981, Wade went back to Police Exploring as an Advisor instead of a Cadet. His scanners were once again used to monitor adjacent jurisdictions and to help coordinate emergency responses. He rode with the Dade County Public Safety Department (now called the Miami-Dade Police Department) twice a week for two years. Officers he rode with on a regular basis complained of "missing the action" when Wade and his scanners were not on board.

Wade shared his communications





knowledge with local government workers, Civil Defense authorities, the Police Explorers and other scanning hobbyists: VHF and UHF radio systems, antennas, procedures, channel plans. Volunteer and assigned duties during hurricanes, Presidential visits, and local events put him in contact with many government and private communication-industry workers. Others soon took notice, even beyond his circle of friends and associates: U.S. Customs paid him a visit in the early 1980s, during the annual Boy Scout Jamboree that was attended by all local Explorer Posts.

Customs was not, thankfully, investigating him for monitoring federal communications. Instead, they wanted to establish an Explorer Post as an educational and outreach program. As everyone may recall, Miami was loosely associated with drug smuggling in the 1980s...not that it made the news or anything!

The Special Agent who conversed with Wade noticed his scanner and presented a challenge of sorts. "You can't hear us," the Agent advised. "You can monitor the locals, but not the Feds!" Even though the Agent was incorrect, Wade thought it best to just smile and not show any disrespect. One didn't mess around with what the locals called "B.T.F.H." or "Big Time Federal Heat."

A few days later, Wade contacted the Special Agent and presented a concise report of frequencies, call signs and operational notes. While that may sound like an arrestable offense, the Agent was both impressed and shocked. The result: establishment of the firstof-its-kind U.S. Customs Marine Law Enforcement Explorer Post, with Wade as the "civilian" advisor and functional leader of the post.

"My ability to monitor his communications got his attention. He was impressed...because I had this information and I was also a 'good guy'...on the side of law enforcement. He asked me to start this Explorer Post, and the next thing I know, I'm on go-fast boats chasing down drug smugglers!"

At the beginning of the "War on Drugs," every coastal police agency put boats in the water and every agency wanted credit for a drug bust. Looking for suspicious vessels in hidden coves and inlets, agencies would often chase each other before they figured out what was happening. For the third time in Wade's Police Explorer history, his scanners became a vital tool for the law enforcement community.

What was Wade's role? During his maritime ride-alongs, he again monitored other juris-

dictions and coordinated tactical responses. Customs, Coast Guard, Florida Marine Patrol, Miami PD, Coral Gables PD and other agencies often had one or more vessels in coastal waters at the same time. If you thought the drug war of the 1980s was a well-oiled machine, you've seen too many movies and TV shows. It was really a mess when it started, and several unpublicized incidents occurred where one agency almost had a shootout with another agency because everyone was undercover.

In the course of running the Explorer Post, Wade taught the Cadets about the pitfalls of communications, especially the Federal variety. Agents were often told their communications were secure, scrambled, out-of-band or otherwise secret. Wade quickly pointed out that such equipment was certainly available, though not in use on a day-to-day basis.

"Part of running the Post was teaching the communications aspect of the job...how communications can work for you. You can coordinate a pursuit without ever exceeding the speed limit. You can conduct a search with the least amount of manpower covering the greatest amount of area. You can run an enforcement operation in plain view of the bad guys and still surprise them. I remember an old advertising slogan, 'You may be able to outrun my car, but you can't outrun my Motorola,' and that's so true when the radios are used properly," he recalled.

#### **Customs changes tactics**

1988 saw the emergence of newer technologies and a transition in Customs to a more balanced law enforcement effort. At the opening of the super-secret Joint Marine Interdiction Communications Center (JMICC or "Jay-Mick"), Wade and the Explorers (almost sounds like a band, right?) met then-Vice President George Bush, Sr.

The Vice President spoke at length to the Explorers and asked "why are all these teenage kids are being exposed to this?" Wade responded, "By knowing the inside story of the drug war, these kids are better equipped to positively influence their friends and reject negative peer pressure." Also discussed were the individual and sincere efforts of the kids and their Explorer experiences. The V.P. expressed his delight in the program.

With the introduction of JMICC, Customs announced a reorganization of the Marine Enforcement unit and the Explorer Post lost their sponsor. Emphasis was placed on the Contraband Enforcement Teams at the airports and seaports (Ports of Entry), and this was not a particularly safe, educational or exciting assignment for the kids. In fact, it was actually safer having the kids on open water, in specially-equipped Customs go-fast boats cruising at over 50 knots, than having them in the bowels of the airport and seaport looking through shipping containers and luggage.

A meeting was then held to determine the fate of the Customs Explorer Program. Wade and two Cadets noted the agency was also placing an emphasis on aviation assets. In fact, Customs had a growing "air force" of helicopters, turboprops, jets and surveillance



platforms. After much wrangling, lobbying and campaigning, the first U.S. Customs Aviation Law Enforcement Explorer Post was born in 1989 at the Customs Air Branch, Homestead Air Force Base, Florida.

Now, Wade was in his element: aviation, law enforcement *and* communications in one sleek package. With Customs helicopters and airplanes traveling throughout the southeast U.S. and Caribbean, Wade conducted research and amassed frequency lists from almost every police agency. He used his scanner to monitor the locals from the helicopter, and later supplied frequency lists to the pilots when Wulfsberg FLEXCOMM synthesized radios were installed. Wade "saw action" in Blackhawks, Cessna Citations, Cessna 404's and other aircraft.

#### Memorable experiences

His Customs Air Branch experience ended in the Spring of 1992 when new responsibilities began at his "real job" in the local traffic department. It was an omen of things to come: August 24th, 1992, saw the arrival of Hurricane Andrew and the neartotal destruction of Homestead Air Force Base, including the Customs Air Branch facilities. They have just recently been replaced at the since-downsized Homestead Air Reserve Station.

When asked about his most memorable experiences in communications, Wade almost glows with pride and excitement. "I used to perform ground ops for the Blackhawk at airshows and schoolyard appearances. I'd secure the Landing Zone (LZ) and guide the bird down with hand signals. The Explorers and the crew would then setup a small exhibit and answer questions about the Customs Service."

"During one airshow, the pilot saw me working with a scanner and asked what I was listening to. The Thunderbirds, I told him. 'No way' said the ex-military pilot." You guessed it...Wade turned up the volume and piped the scanner through the helicopter's Public Address speakers! It was the first time that any of the ex-military men had ever heard the T-Birds communicate.

"I also remember the importance of altitude, which is something most of us can't use to our advantage. I needed to communicate something to an Explorer in Miami, but I was in a Customs airplane four thousand feet over Naples (on the west coast of Florida). The Explorers used a licensed UHF business-band system at the time, and I communicated in simplex mode from the west coast of Florida...hand-held radio to hand-held radio...and that was just amazing."

On the hobbyist side of things, Wade used to attend most of the Space Shuttle launches.

"We went up there in my van, with about seven scanners and magnet mount antennas. Bearcat 210s, 220s, 250s, Pro



These days, a National Guard UH-60 Blackhawk helicopter is as likely to be fighting Florida fires as doing Customs duty. DoD photo by Master Sgt. Bob Haskell, U.S. Army National Guard.

2004s, 2006s, handhelds...probably over 1,000 channels, and it still wasn't enough to monitor everything at the Space Center. My van looked like a porcupine, and we caught the attention of everyone from the tollbooth operators to the Air Force!" In fact, Wade was part of the group of Miami-area monitors who developed the first Kennedy Space Center frequency list that was published by Bob Grove.

Wade has used his scanners and knowledge for many local government and hobbyist projects over the last 20+ years. He has participated in Emergency Management exercises, testing of the county's 470 MHz bandplan and later the 800 MHz EDACS Trunked system, several emergency response and disaster recovery activities, monitoring trips to Walt Disney World, movie filming locations, parades, races, and many other adventures.

#### Wade on scanning today

Wade left local government service in 1998 and now works for an aerial photography firm, where he interprets aerial photos and produces large photo exhibits for attorneys, engineers, investigators, realtors, and property owners. He still has a Pro 2004 and a 2006, plus newer OptoElectronics boards, TrunkTrackers, and a JD-100 Aviation Band scanner.

"Anyone who is serious about MilCom and MilAir should have this scanner [the JD-100]," advises Wade. "I also use it regularly on airline flights. I ask permission from the pilot, of course, but when they see 'Sporty's' and 'aircraft receiver' on the back plate, they always say it's O.K. to use." "Just don't point out my mistakes when we

land," one pilot jokingly told him.

His views on more recently-interested hobbyists? "We didn't have the Internet or even OptoElectronics Scouts. If we wanted a frequency for a particular agency, we first looked at the antennas. We studied antenna catalogs and learned to identify radio bands and antenna models on sight. We even *measured* antenna lengths if we could get away with it."

"Then, it was a matter of research. Once we knew what band the antenna was on, we studied the bandplans and licensing directories such as *Police Call*, Grove's books, and even microfiche at the F.C.C. offices to narrow down the possible frequencies. Then, we sat back and listened until something was confirmed."

"Many more informational resources exist today, plus all the newer equipment to help find active frequencies. And, while I like the way the Internet lets everyone share their information, I'm disappointed when some hobbyists just want everything handed to them. They obviously have no knowledge...and no interest...in learning how the frequencies and bands and channels and systems all fit together."

"I also recommend that hobbyists think 'outside the box.' If you don't have a trunking scanner, listen to the inputs. It's more useful than you imagine. If you want to find all the channels in use at an event, then come early and stay late and search every applicable band. If you're not sure if an agency or location uses radios, just assume they do and start your research. Just because it hasn't been published doesn't mean it's not out there."

## **Beginner's Corner**

Ken Reitz, KS4ZR ks4zr@firstva.com

### Motorola's DCII Sidecar & Your Satellite Letters

f you believed the ballyhoo from your local satellite TV dealer, C/Ku-band satellite TV is as dead as my chances to win the lottery. Once proud promoters of a new technology, most of these dealers have succumbed to the pressures of the market and, inadvertently or not, have done everything they could to kill the big dish industry. And who could blame them? The easy bucks for installations of the little dish; fat commissions from overpriced entertainment packages; and a bounty paid for converting existing C-band customers to the little dish were more than enough incentive for many. The bulk of America's satellite TV dealers have dropped the big dish from their inventory.

The result is that the big dish industry has been losing an average of 20,000 subscribers per month over the last several years. Sources inside the industry expect that figure to taper off to a solid base of between 600,000 and a million subscribers. It's this figure which is expected to guarantee continued C-band programming for many years to come. To put C-band's losses in perspective consider this: In the first quarter of this year DirecTV alone lost an average of 166,000 subscribers per month. Figures on DISH Network losses weren't available. Most of C-band's lost subscriptions went directly to the small dish while the bulk of the little dish lost subscribers are said to have gone back to cable.

The one number no one in the industry can nail down is the exact number of big dish viewers. It's quite possible that there are several hundred thousand folks watching big dish satellite TV without the benefit of a decoder, choosing instead to watch the wild feeds, the channels in the clear or just listening to all the audio services. These, in addition to the dozens of ethnic programming sources, specialty channels (such as NASA-TV), and a number of other services simply unavailable anywhere else, give more than a few reasons to have a dish without having to

pay for cable fare. Still, the current core of 1.1 million big dish subscribers who opt for the decoder are loyal and refuse to give up what they consider to be a superior TV technology.

While many areas have lost their local dealers there are some notable exceptions. Some areas are blessed with dealers who believe consumers should be able to choose between the two systems and offer side-by-side comparisons in their showrooms. Another notable exception is Skyvision, a long-time *MT* advertiser and a real resource for those of us who enjoy the hobby of DXing the skies for interesting audio and video. Still another exception is Motorola which bought General Instrument, maker of satellite and cable TV equipment including the amazing 4DTV satellite receiver (see *MT* December 2000 page 72 & 73).

Those who read my review of the 4DTV receiver may have been disheartened by the \$900 price tag. But, as suggested in the piece, Motorola has now released their DSR905 "4DTV Sidecar." This device allows you to access the hundreds of DigiCipherII (DCII) digital channels by connecting to your existing analog receiver. It also allows access to the digital program guide (which lists all analog and VideoCipherII [VCII] channels in addition to DCII); one button payper-view movies on the DCII channels; and includes a 4-in-1 IR/UHF remote control. It's the simplest solution to bringing the ever-expanding digital universe on C and Ku-band to those who are interested but who don't want to give up their current, and still very useful analog receiver. The best part is that the Sidecar sells for less than half the price of the full-fledged 4DTV. Skyvision sells the product for \$400 plus \$27 shipping. I've also seen the product discounted in Skyvision flyers.

Music lovers will appreciate being able to tune the more than 100 digital audio services from Digital Music Express (DMX) and Music Choice (MC). There are also dozens of public television feeds from Georgia, Nebraska, South Carolina and PBS central which are unavailable in analog format on both C and Ku-bands. In fact, the DCII mode has really changed the face of big dish satellite TV. To get an idea of the channels available in the DCII format (and all other analog and VCII channels for that matter), check out Motorola's 4DTV web site http://www.4dtv.com.

#### Motorola Speaks

Earlier this spring I talked with Ajamu Bernard, 4DTV Marketing Manager at Motorola, about the current state and future prospects of the C-band universe. Bernard says there are currently 100,000 4DTV units in the marketplace with both the receiver and the sidecar "...moving very well through the marketing channels."

I asked him how long pay networks such as HBO, Showtime, etc, which are currently available to both VCII and DCII subscribers, will continue to simulcast the VCII broadcasts and further, how long analog C-band signals, such as TBS, The Weather Channel and others not in DCII format will remain available to VCII viewers.

"For a very long time," says Bernard. "Remember, C-band is the backbone of how programmers transmit their programming to cable systems. So, until cable makes the commitment to go totally digital, the main channels will continue to be available in analog formats." I would also add that there are many thousands of cable companies throughout the U.S. all of which are loathe to spend one dime more than they absolutely have to in order to upgrade their service. A digital upgrade to these companies represents a major investment.

Bernard also noted that, "...premium channels have a higher penetration rate and make a higher margin on C-band than they do anywhere



Motorola's 4DTV Sidecar (DSR905) allows access to hundreds of DCII digital audio and video services (many for free), a digital satellite guide (updated daily), one-button Pay-Per-View option, and a 4-in-1 IR/UHF remote control. (Courtesy Motorola)

else. Part of the reason for this is the fact that 4DTV is the only format that allows customers to receive the full suite of programming, thus customers have a higher satisfaction rate.'

Customer satisfaction aside, few will argue with the profit motive. Since the average C-band customer spends about \$30/month in subscription fees, programmers rake in a staggering \$33 million dollars per month. Who would want to kill such a golden goose?

#### TVRO Mailbag

Chris Singleton, KE3MC, from Worton, MD, writes, "...saw your article in the April issue of MT. What caught my attention was at the end, you mentioned that you could use an old Primestar dish and LNB along with an MPEGII receiver to receive Telstar 5 for instance. I have an old Primestar system and....my question is this: Is there any way that I could modify the Primestar receiver to work with anything else?...I'm really not interested in investing hundreds of dollars into this..."

Chris, the Primestar receiver is essentially junk. You might be able to scavenge parts from the boards etc., but, the real operating is in the receiver's software. Still, you needn't invest hundreds in the hobby because an MPEGII receiver, even new, can be had for well under \$200. In fact, as the next letter explains, it pays to look around.

Ralph Siebert, long time MT reader and TVRO enthusiast, wrote recently, "...I really made out good here with some equipment. I never

got addicted to cigarettes or alcohol but Ebay has got me. I picked up a brand spanking new DMT-2000 [MPEGII receiver] for \$200 plus \$10 shipping ...and it works great; I get some new channels that the DMT-1000 wouldn't pick up...Last week I bought a GI 450i C-band receiver from a lady and paid \$81 for it...it arrived Friday and it doesn't have a scratch on it. It is very sophisticated...it even programs the other sats when you put two in...

Well, Ralph, you did good! The GI 450i new still sells for \$500. There are many places to get great deals on new and used TVRO equipment. The cheapest is to look in the local "weekly trader" papers in your town or county. Folks are always wanting to give away complete satellite systems. Even if you have to pay \$100 for the whole dish, receiver, feed horn etc., if it's in really good condition, it's a cheap way to get into the satellite TV hobby. Installation is easy and the only thing you'll need to buy new is the cable to run from the dish site to the house. From then on all you'll have to do is program the receiver and start DXing the Clarke belt. And that brings us to the next letter.

Steve Stenslie writes, "...you wrote an article about setting up a really cheap fixed-dish (probably 4-5 ft.) straight receiver (for nonscrambled analog feeds) for someone who lived way out in the country. I mentioned it to my uncle (who lives way out in the country) who was only moderately interested. Now, maybe 3-6 years later, any help in finding which issue it was and then getting a copy if you have one would be very much appreciated."

Steve, I've done a lot of articles in the past couple of years about setting up such a system so it's hard to say which one it was. At any rate, the answers in the previous question will help and these sources may be quite useful as well: http://www.lyngsat.com lists all audio and video services on all satellite around the world. It's kept up to date daily. For new MPEGII systems and components (including 4.5 ft. dishes) check out http://www.smallear.com and http:// www.global-cm.net.

There are a few new developments in the area of smaller C-band dishes which are worth looking into. Both Panamsat 9 and Anik F1 are two very powerful C-band satellites with a lot of in the clear (Free-to-Air) MPEGII channels. They should show up nicely on a 4 ft. dish. By the next installment of "TVRO Update" here at the Beginner's Corner I'll have some definite facts to relate. In addition, I'll be reporting on a small, inexpensive dish mover for the Smallear's 4.5 ft. dish. Stay tuned!

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## Ask Bob

Getting Started

Bob Grove, W8JHD bgrove@grove-ent.com

- Q. Why are some "wall warts" (AC power cubes) so large and heavy, while others are small and lightweight? (Richard Dailey, Pittsburgh, PA)
- A. Power supplies contain transformers, windings of copper wire on an iron core. If a radio or other appliance requires heavy current (amperage), larger-diameter wire and more iron must be used to maintain efficiency and prevent resistive losses. Thus, the higher the current rating, the heavier the power supply.
- Q. I enjoyed "Waiting for the Go Code" in the July 2000 issue of MT, as well as a recent EMP question in "Ask Bob." While I can't afford a copper screen room. I'd like to be able to have reception after a nuclear event. Is there any way to protect equipment on a smaller budget? (David C. Lowe, Sweetwater, TN)

A. Extensive tests were done in the '80s and '90s using artificial lightning-discharge techniques to emulate the electromagnetic pulse (EMP) from a nuclear detonation. These tests revealed that although older, vacuum-tube equipment was more resilient than low-voltage, solid-state equipment, the newer transistorized stuff really was tougher than anticipated.

Screen rooms aren't necessary, although some diehards keep a spare radio in a metal box, or wrapped in aluminum foil to fully shield it from EMP. If you are far enough away from a nuclear event that you survive it, chances are your equipment did, too. But a few precautions go a long way to preserve equipment from such an unspeakable event.

Antenna and power cable lengths in excess of 3-4 feet should be shielded. Surge protectors should be installed on antenna and AC lines. Disconnect and tightly coil up unused antenna, power, control, and audio cables to repel induced current flows. Connect all equipment to a common earth ground.

That should do it.

**Q.** I recently noticed a factory stamp on a radio that said, "Burn-in test OK." What does this mean? (Mark Burns, Terre Haute,

A. The term "burn-in" refers simply to an extended period during which the equipment is left on to be sure it isn't likely to fail after the customer receives it. Burn-ins are typically 24-48 hours, and since there are no rigid industry standards, it's up to the manufacturer just what tests he makes and how long he leaves the equipment powered

Q. What is a good way to polish scratches from the front plastic bezel on the display of my radio? Chapman, (Robert Machiasport, ME)

A. I've had excellent success with non-abrasive metal polishes like Brasso; I've even rubbed out minor abrasions with my thumb, rubbing briskly as it feels hot (but don't overdo this or you'll get a blister!). Some hobbyists have tried polishing with tooth paste, but I've not confirmed this. Finally, you might try buffing it with dressmakers chalk (perhaps as a paste?), commonly used in silver polish.

Readers? Any pet procedures?

Q. I now own a classic R390A communications receiver. Where can I get 600 ohm headphones and speakers? ( Harry Sliger, Indianapolis, IN)

A. It is very common for owners of this receiver to simply get an audio output transformer from Radio Shack. Order the 32-1031 (\$5.99), a 10 watt device that will match the high impedance output from your receiver to any 4, 8, or 16 ohm speaker or headset. Another, lower cost, lower power transformer is the 273-1380 (\$1.99) which will operate any 8 ohm (or so) speaker or headset, but at lower power levels.

**Q.** Are lie detectors influenced by intimidation? Can a sociopathic liar (like some politicians) fool one? (Mark Burns, Terre Haute,

A. Yes, and yes. A simple "lie detector" like a toy galvanic skin response (GSR) device is highly erratic, influenced by perspiration, pressure, and emotional response. A professional polygraph, however, has several attachments, including a pneumograph (breathing rate), GSR, blood pressure, and pulse rate. All of these factors display their findings on a pen trace which records on paper any wide changes in body response when key questions are asked.

Still, such a procedure is subject to the same variables as the simple device, and a nervous, innocent subject can make the pens go wild, while a cool sociopath can look the examiner right in the eye and lie without detection.

Q. I have a cordless phone with a swivel-based whip. If I remove the screw holding this and replace it with a longer antenna, may I expect greater range? (Raymond Vane, Ft. Myers, FL)

A. Assuming it's a 40 MHz-range phone, probably so. The "iffy" part is whether or not the output circuit of the phone has been resonated to match the length of the present antenna. In that case, it could actually reduce range if you attached a different length. But the answer is, try it; you won't damage the circuitry.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bgrove@grove-ent.com. (Please include your name and address.) The current Ask Bob is now online at our website: www.grove-ent.com

## **Bright Ideas**

Getting Started

Gary Webbenhurst ab7ni@arrl.net

I frequently do radio repairs on "the bench." This is delicate work. Small screws and springs can easily get lost. Plus, I do not want battery acid or solder materials ruining my tabletop. I needed a special surface

for such work. I found a cloth/carpet strip made for gun repair. When not needed, I can roll it up and store it out of the way. Any large gun store would carry this type of product.

I further protect my work surface with a sheet of clear plexiglas. Underneath the plexiglas, are the important pages of information I often need while scanning. The sheets of paper are always visible,

but also protected from soft drinks spills, and pizza crumbs. OK, I admit to occasionally drooling while reading the MT ads.

Reader Robert Homuth wrote about his PRO-2056. It's the older Uniden/Radio Shack 20XX model line with no keypad. The only banks are POLICE, FIRE, AIR, WX, MARINE, and PRI-



VATE. The only other buttons are for PRO-GRAM, BAND, SEARCH, LOCKOUT, HOLD, and up/down arrows for searches. Robert reports it works great for skip opening detection. He suggested programming the PRIVATE bank with the following frequencies:

29.000	Ham	simplex	calling	
29.025	Ham	simplex	alternate	
29.500	Ham	simplex an	d some remote lii	ıks
29.600	Ham	simplex an	d other remote lin	ks
29.620,	29.640,	·		

29.650, 29.660, and 29.680 ham repeater outputs California 50.300 Simplex 50.400 Simplex

52.525 Simplex nationwide

You can also lock out all the FIRE channels above 50 MHz, then fill the 10 programmable remaining channels with ham ten-meter and sixmeter frequencies. The Uniden Bearcat 350A and other models are still in stock. These scanners are inexpensive and thus very good as a dedicated use scanner. Since they have no numerical keypad, they are a little bit difficult to program.

Hence, they are often found at garage and flea market sales. Frustrated owners simply give up on the scanner rather than unlocking its potential. Great idea, Robert.



If you have a large collection of scanners, and radios - ham or otherwise - you should consider taking pictures as proof of your collection. Then talk to your insurance agent about a special rider to

cover the radios. I also recorded the radio serial numbers. Whenever possible, I program my radios to display my name and callsign when the radio is powered up. I also opened the radio and place my name and phone number in the battery compartment. If you have an expensive computer and peripherals, you might also ask about ensuring them at the same time.



Here is an idea from "Bob." He had a problem with the rubber keypad keys on his radio. After thousands of punches, they failed to make the proper contact with the circuit board below. There are two

possible fixes he suggested. The first is a flexible conductive mixture made by Chemtronis, their part # CW2610. It completes the circuit as the two materials bond together. Check'em out at http://www.chemtronics.com/.

Another possible answer is Loctite's "Quick Grid" repair resin. About \$10 in automotive and electrical supply houses. As with any modification or repair of your radio, if you are not familiar with working on these small and complex electronics, do not attempt do the work yourself. Thanks, Bob.



This next tip comes from reader Patrick Brown, WB5JHG. He ordered a new Drake MS8 External Speaker. He was not happy with the midrange speaker, so he replaced it with a Radio Shack 4" full range

> speaker (Catalog#40-1197). All he needed to do was remove the Drake speaker and use a round file to enlarge the screws opening on the RS

speaker. He soldered the new speaker wire, paying careful at-

tention to polarity. He then assembled the new speaker in the Drake case. He reports he was very pleased with the new sound. Thanks, Patrick.



To escape the heat, I recently spent the day at the local mall. I am always on the lookout for items that might apply to our radio hobby. I decided to wander through a camera store. I found small padded cases that work well for some of my radios. Best part of all, was the price. They had a large bin they were closing out at \$5.95. I grabbed a handful at that price. My Scout<sup>™</sup> frequency finder and Yaesu VX-5R now have new homes when I am out and about. They have better protection and no one pays much attention to a small pager-like case on your belt.



In these changing times, we must be prepared for rolling electrical blackouts. If your radios and clocks need a backup 9 volt battery, be sure you are prepared. I like to keep a large 12-volt gel cell

battery to run my scanners. In fact, I actually

have a computer uninterruptible power supply (UPS) just for my listening station. You can find these in the \$40-100 range at most office supply stores. Since we can all expect some electrical problems, good surge protector is more



important than ever. A lot cheaper than buying new radios.

We are in the midst of another busy fire season. Keep those scanners tuned for the VHF fire frequencies. Keep the lights off, and we will meet again next month.

#### RadioMap

Transmitter sites in your area are researched and marked on a beautiful 11 x 17 full color plot. See FCC licensed sites from VLF through microwave plus selected FAA transmitter sites. Callsigns, frequencies, and names provided. Ham radio stations excluded frequencies, and names provided. Ham radio stations excluded. You choose the map center location - anywhere within the United States. We adjust map coverage for best readability. Deluxe report includes additional index by frequency and local spectrum occupancy chart.

Used by radio professionals and hobbyists since 1994 for identifying towers, sources of radio signals, interference, etc. Send nearest street intersection for map center and check for \$29.95 or \$39.95 (Deluxe report) payable to Robert Parnass.

Robert S. Parnass, M.S. Radio electronics consulting 2350 Douglas Rd., Oswego, IL 60543-9794 www.megsinet.com/parnass



Robert Wyman wymanent@bellsouth.net

## A Scanning Smorgasbord

elcome to August and a busy edition of the Scanning Report. First, I extend my sincere "thank you" to Mike Fink, Nick Gossman, Ken Freriks, Greg Gilbert, Don Baker, Michael Wallach, Ben Meyer and John Braden for their supportive comments about my March 2001 article on MilCom monitoring. Thanks for taking the time to write and share your thoughts. Another "thank you" is offered to Ken Windyka, a longtime contributor who holds down the monitoring fort in Springfield, Massachusetts. Ken's outstanding reports can be seen on the MilCom mailing

In the June issue I mentioned my use of a Personal Data Assistant (PDA) to store frequency information. Popular brands include devices from Palm, Handspring and Sharp. Gerry Gomes, Communications Specialist for Wayne County, Michigan, writes, "Is there somewhere on the Internet to download one of these databases?"

Today's PDAs have the ability to synchronize data with Personal Information Manager (PIM) programs such as Microsoft Outlook or Internet calendar/ address book/notepad sites such as Yahoo Calendar and Excite Planner. If you type a frequency list into your computer using an address book or notepad format, you should be able to import that file into the PDA. Similarly, an online file using Yahoo, Excite, or any of the other PIM portals can also be im-

Check your PDA's help file for additional information or restrictions on importing files. Also, backup your existing data before importing anything new...some PDA's have enough memory to hold multiple files, while others will overwrite the existing data with new data. That means your existing data is erased, so be careful.

Frequent MT contributor John Mayson also wrote in to advise everyone of his new Texas Radio Guide. Check out the link to his free website at the end of this column.

Chris Parris was recently at **Dodger** Stadium in Los Angeles. He found the following channels during a baseball game:

451.450, Digital PL 047 — Channel 4

451.500, Digital PL 071 — Unid. Use

451.875, Digital PL 032 — Channel 3

451.950, Digital PL 134 — Channel 1 "Command Post"

452.725, Digital PL 026 — Unid. Use

456.350, Digital PL 114 — Unid. Use

464.550, Digital PL 612 — Unid. Use

Chris adds, "the DPL codes are important, as these frequencies seem to be in use by lots of other users in the LA area, and the only way to really keep on top of the activities at the ball game was to use a scanner with DPL capabilities."



I attended the annual Dayton HamVention in May, along with Chris Parris and Jorge Rodriguez...and several thousand others, of course. I enjoyed speaking with the former author of this column, Barnett, at his ScannerMaster booth (and I picked up Police Call on CD...don't think about it, just buy

it...available from Grove Enterprises or ScannerMaster.

The folks at OptoElectronics and Vector Products were hospitable as always. It's amusing that I travel from Fort Lauderdale to Dayton, just to see the products of two compa-



nies that are actually located in my back yard!

Chris and I also purchased the WinRadio AX-31B planar antenna, based on Bob Grove's review in the April edition of MT. Chris used his throughout the Dayton and Cincinnati areas with excellent results on all bands. We also checked out Wright-Patterson AFB and the U.S. Air Force Museum, and met Brian at "The Spot," his famous plane-spotting location at the perimeter of Wright-Pat. Brian's reports are also featured on the MilCom mailing list.

Also in May, I spent a little time monitoring the annual Fort Lauderdale Air & Sea Show. Unlike most airshows, this one takes place over the beach and Atlantic coastal waters. It's one of those events in which a team of monitors with a truckload of scanners are the only way to catch all the action. Military VHF and UHF airbands, military and commercial land-mobile bands, marine band, Family Radio Service, public safety bands, TV and radio stations...it's overwhelming. Following is an example of the frequencies you'll find at this annual

#### Fort Lauderdale Air & Sea Show 2001

kHz AM

610 WIOD ("live" continuous coverage of airshow) MHz AM

119.300 FLL tower (Fort Lauderdale-Hollywood Intl Airport)

121.400 FLL ground

122.825 Ian Groom FedEx aerobatic demo

123.100 USCG SAR demo

123.175 unid. aerobatic team

123.475 Army Golden Knights

132.900 Air Boss

141.850 USAFT-birds air/air



157.150	USCG perimeter vessels
251.100	MIA departure (Miami Int'l Airport)
251.900	USAF Air Rescue Combat SAR demo
255.400	FSS
257.800	FLL tower
272.100	Snowbirds
285.600	MIA approach
295.700	HST tower (Homestead Air Reserve Base)
322.950	USAF T-Birds air/air
343.000	unid. interplane
380.200	MIA approach
380.300	MIA approach
381.800	USCG SAR demo
413.025	T-Birds ground support comms (not aircraft) at FLL

This is just a small sample of what was out there. Also in use were city and county trunked systems, various private repeaters and rental radios, and several military interplane or squadron channels that I didn't get a chance to hear!

The "On-Scene Commander" department will continue to spotlight special events attended by *MT* subscribers. Please send your on-scene stories and frequencies to me at the e-mail address listed above.

#### Florida Fires

June's lead story on fire fighting mentioned that both 2000 and 2001 have been active fire seasons for Florida. Following is a list of active fire frequencies contributed by Mike Comer of Titusville, Florida, west of the Kennedy Space Center. Those frequencies marked with an asterisk were monitored by Mike; the others he can vouch for! Thanks, Mike; we like to see this kind of verified list!

<sup>\*</sup> monitored, confirmed active # reported by others

118.050*	Forestry air-air Gainsville/Hunters Creek Fire Orlando
122.750*	LEAD air-air with Tankers
128.550*	NASA Tower
122.925*	Forestry air-air
123.025*	Forestry, News air-air
151.235#	Forestry — Tactical
151.295*	Forestry — Tactical
154.175*	Brevard County Fire Rescue South paging
154.265*	Mutual Aid RED
154.280*	Mutual Aid WHITE (patch with Orange County 800)
154.295*	Mutual Aid BLUE (unid FD primary)
154.385*	Brevard County Fire Rescue North paging
154.445*	Brevard County Fire Rescue Central paging
159.240*	Forestry — Jacksonville District (band opening)
159.270*	Forestry — Orlando District
159.285*	Forestry - Ch-11
159.300*	Forestry — Orlando Flight Following
159.300*	Forestry — Withlacoochee Flight Following
159.315*	Forestry — car to car
159.330*	Forestry — Lakeland District
159.405#	Forestry — Okeechobee District
159.450*	Forestry — Bunnell District
164.125*	Forest Service (Control-Ocala Base)
164.625*	US Fish & Wildlife Service (repeater Ch-5)
168.350*	National Interagency Fire Center
168.625*	Forest Service Tanker
169.175*	Forest Service Helos
170.475*	Forest Service Ch-21 Air-Ground

172.275# Air Tanker 420 for air drop Martin County Orange County FD Fire 11 2416 patch to 154.280

<u>Aircratt</u> :	
10Foxtrot	
*Air Attack 747	
*Retention Pond Air Atta	ck (Hunters Creek area)
*LEAD 52	
*LEAD 53	
*LEAD 77	
*Helo 70C	Firehawk
*Helo 261BH	Fish & Wildlife, Bell 206B, Jet Range
*Helo 164EH	Bell 412
*Helo 744	
*Helo 747	Sky Crane
*Helo 612RM	Sikorsky S-61N (CH-3)
*Privateer ##	Fla National Guard UH-60
*Sheriff 3	Orange County CHASE
*Tanker 05	P2V Neptune
*Tanker 23	P-3A
*Tanker 26	P-3A
*Tanker 62	DC-7
*Tanker 66	DC-7
*Tanker 124	P4Y2
*Tanker 160	C-54E

#### ♦ The Views of the Host...

no listing

#Tanker 420

I'm going to add a brief editorial to this month's special "Who's Listening" segment, which is appearing in the feature section

This hobby is an outgrowth of the radio industry and the innovative "radiomen" who designed circuits, fabricated components, adopted operational policies and established the various radio standards that are still followed today. Without this focused approach, we probably would not have the equipment and knowledge we currently enjoy.

Yet, all the hobbyists I know...both men and women...are quite diversified in their interests and specialties. Radios, computers, cameras, cars, aviation, firearms, law enforcement, fire-rescue and "extreme sports" seem to be common elements. Perhaps the radio pioneers also had diverse interests of their time...they just weren't recorded for posterity.

The fact that all hobbyists use their knowledge for positive means and community service is one of the "platforms" which you'll see regularly in this column. I am personally offended when the hobby is characterized as something questionable at best and criminal at worst.

Certainly, anyone who has used a scanner or scanning information in the commission of a crime cannot be labeled a "hobbyist." Such an individual is simply a criminal who has adopted scanning as a tool for illegal activities...just as they have similarly adopted their automobile, their cellphone, their firearm or their computer. Positive and law-abiding uses of scanners are everywhere. It's up to all of us to get the word out and change any lingering, negative percep-

tions that we encounter.

The best example of a law-abiding hobbyist? A law-enforcing hobbyist. This month's "Who's Listening" candidate, Wade Langley, has many diversified interests, plus one which few in the hobby share: the ability to teach. We'll return to a shorter "Who's Listening" format next month.

#### Bank Number One

As a follow-up to last month's column on UHF wireless microphone channels, here are some VHF selections to try. These are used by law enforcement agencies running videotaped traffic stops, DUI squads taping roadside sobriety tests, training units, news reporters, and public address systems in auditoriums and conference rooms.

A recent check of these channels in South Florida found activity by law enforcement (Collier County Sheriff's Office traffic units), a local church service, some musicians at a nearby club, a meeting in an office building, and a news media wireless microphone transmitting back to the camera-mounted receiver. I've also heard them used for training at the Federal Law Enforcement Training Center in Gynco, Georgia.

Range is very limited...several hundred feet at best...but you never know what you may hear from your base or mobile location.

#### **VHF Wireless Mic Channels**

(produced by several manufacturers) 169.445 169.505

170.305

171.045

171.105

171.905

#### On the Keyboard

In September we'll look at another member of our monitoring family, visit summertime special events, and look into Canadian frequency websites. Send *your* information to me via e-mail to be featured in a future Scanning Report column.

#### Links of interest from this column:

MilCom mailing list, http://www.qth.net Yahoo Calendar for storing frequency info,

#### http://calendar.yahoo.com

Excite Planner for storing frequency info, http://www.excite.com John Mayson's *Texas Radio Guide*, http://groups.yahoo.com/

group/CenTexComm/files/Texas\_Radio\_Guide.PDF
Dayton HamVention, http://www.hamvention.org
Police Call on CD\*, http://www.scannermaster.com
OptoElectronics, http://www.optoelectronics.com

Vector Products, (954) 584-4446

WinRadio planar antenna\*, http://www.winradio.com
Wright-Patterson AFB, http://www.wpafb.af.mil
U.S. Air Force Museum, http://www.wpafb.af.mil/museum/
Fort Lauderdale Air & Sea Show, http://www.airseashow.com
U.S. Customs Service, http://www.customs.ustreas.gov
\*also available from Grove Enterprises, http://www.grove-ent.com

## **Service Search**

130.575

129.725

122.950

Larry Van Horn larry@grove-ent.com

122.950

122.950

122.950

## **Fixed Base Company Frequencies**

Raytheon Aircraft Service

Raytheon Aircraft Service

Signature Flight Support

Piedmont Hawthorne

ICT

Mid-Continent Airport, Wichita, KS

Indianapolis International, IN

Indianapolis International, IN

Winston-Salem, NC

In this month's column we will explore some civilian aircraft "company" assignments used by Fixed Base Operators (FBO) in the 128.825-132.0 MHz range. FBOs are the commercial operators who supply fuel, maintenance, aircraft sales, rental, flight training, handling and other general

Pattern   Patt	tonon	aa airaraft salas	rantal flight training	handling	and other general	INI	Predmont Hawthorne	Winston-Salem, NC	122.950	
Post				nanumig	and other general	JY0	Piedmont Hawthorne	Leesburg Airport, VA	132.000	122.975
Post	aviati	on services at an	airport.			KEF	IGS Ground Services	Keflavik International, Iceland	131.900	
Part			•					,		
Company   Comp	4	rno		F					101.775	100.050
Refuser Marchinates   Allerhouse   Allerho					•					
Many   March   March   Many   Many   Many   Many   Many   March   March   Many   Man	ID	Company	Airport	ARINC	Unicom	LAS	Raytheon Aircraft Service	McCarren International, NV	128.850	122.950
Many   March   March   Many   Many   Many   Many   Many   March   March   Many   Man	ABE	Piedmont Hawthorne	Allentown, PA	122.950			Signature Flight Support	McCarren International, NV	128.750	122.950
April   Common   Co			'			LAV	0 0 11			
Money Nomina   Mone										
May   Provision Care   Supprison Registry Support   May   Provision Care   Supprison Registry Support   May   Supprison		Raytheon Aircraft Service	, ,							
May   Professor & Content   St. User's Register Alpha Operation   128.550   122.550	ADS	Mercury Aviation	Addison Airport, TX	131.600		LGA	Signature Flight Support	La Guardia Airport, NY	129.700	122.950
May   Professor & Content   St. User's Register Alpha Operation   128.550   122.550	ΔIR	Signature Flight Support	Albany County NY	129 700	122 950	HT	Raytheon Aircraft Service	Little Rock Airport AR	130 575	
March   Symboth Fight Support   March   Symboth Fight Support   March   Summary Alexandra   March										
Page   Symptom High Support   Age   Symptom						LZU				
Marcay Ancience   Melarus frontined, A										
Act   Marcus Ambriding Support   Marcus Ambriding Support   Marcus Appendix Support   Marcus A	APA	Signature Flight Support	Denver Centennial, CO	129.725	122.950		Piedmont Hawthorne	Gwinnett County Airport, GA	123.050	123.050
March   Ashibub   March   Suppose   Suppose   Perfect   Suppose		Mercury Avintion	Atlanta Hartsfield GA	131 650		MCO	Signature Flight Support			122 950
Act		,			122.050			•	122 050	122.750
Big   Symmer Fight Symptor   Marcusy Animato   Bedder, MA   130,800   131,875   122,950   MA   Symmer Fight Symptor   Marcusy Animato   Bedder, MA   130,800   131,875   122,950   MA   Symmer Fight Symptor   Marcusy Animato   Bedder, MA   130,800   131,600   MA   Symmer Fight Symptor   Marcusy Animato   Marcusy Animato   Bedder, MA   130,800   131,600   MA   Symmer Fight Symptor   Marcusy Animato   Marcu					122.730			,		
Bold   Suprature Fight Support   Management   Support   March   Management   Mana	AVL	Asheville Jet Center	Asheville Kegional Airport, NC	129.825		MUW	Amerilech	Midway Airport, IL	130.500	
Bold   Suprature Fight Support   Management   Support   March   Management   Mana	BCB	Virginia Polytech Institute	Virginia Tech Airport, VA	123.050			Signature Flight Support	Midway Airport, IL	128.925	
Ref   Memory Avination   Register (A March   131,000   Mile   M		Signature Flight Support			122 950	MEM				122 950
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Bill   Mill-Ohin Anthronin	BFL	Mercury Aviation	Bakerstield, CA	131.600		MIE	Muncie Aviation	Delaware County-Johnson Field, IN	122.950	
Bill   Mill-Ohin Anthronin	BHM	Raytheon Aircraft Service	Birminaham International Airport, AL	130.575		MKE	Signature Flight Support	General Mitchell International, WI	131.000	
March Andreina   MacCheb Andre										
BAM										
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Mercury Air	BLA	Beaver Lake Aviation	Rogers, AR	122.8/5		OCF	Piedmont Hawthorne	Ocala Regional, FL	123.000	
Mercury Air	BMI	Image Air	Central IL Regional, Bloomington, IL	122.950		ONT	Mercury Aviation	Ontario International Airport, CA	131.600	
Marcray Austrine   Marcray Austrine   Marcray Austrine   Signature Hight Support   Marcray Austrine   Marcray Austri		Marcury Air								
Signature Flight Support   Signature Flight Su	DINA	,	,							100 050
Post   Signature Flight Support   Signature Fl										
Bulk   Mercury Aristinon   Bulbonik, CA   131.600   129.501   12		Signature Flight Support	Nashville International, TN	131.100		ORF	Piedmont Hawthorne	Norfolk International, VA	130.575	122.950
Bulk   Mercury Aristinon   Bulbonik, CA   131.600   129.501   12	BOS	Signature Flight Support	Logan International, MA	130.250	122.950	PBI	Signature Flight Support	Palm Beach International, FL	128.975	122.950
Signature Flight Support   CK   Signature Flight Support   Signat							0 0 11	•		
GK   Signature Flight Support   Meins Althoring   Meins Althorin					122.050	TUK	,			
GMA   Krystal Arietina   Lewell Fladif-Chartmonogn, TN   129, 150   122, 95			•							
Character   Pedmonth Howthome   Character   Characte	CGX	Signature Flight Support	Meigs Airport, IL	128.925	122.950		Mercury Aviation	DeKalb Peachtree, Atlanta, GA	131.650	
Character   Pedmonth Howthome   Character   Characte	CHA	Krystal Aviation	Lovell Field/Chattanooga, TN	129.150			Signature Flight Support	DeKalb Peachtree, Atlanta, GA	130.900	
Cold   Pedmont Howthome   Coder Royals, is   122.950   RP   Signature Flight Support   Cold		,				PIE				122 950
CIT   Signature Flight Support   Charlest-Woughes International, NX   131.60   122.950   RFD   Rept-most Handstranse   Rockfood Airport, II.   130.575   1										122.730
Marcury Aniotino   Carpus Christi International, IX   131,600   RED   Roytheon Aircraft Service   Red-frond Airport, IL   130,575   130,807   122,950   RIC   Allilian Air   Red-frond, VA   130,807   130,800   130,8										
Signature Flight Support   Carjus Christi International, IX   130, 305   122,950   RIL   Corporation Facinities   Corporation	CLT	Signature Flight Support	Charlotte/Douglas International, NC	128.825	122.950	RDU	Piedmont Hawthorne	Raleigh-Durham International, NC	131.150	
Signature Flight Support   Carjus Christi International, IX   130, 305   122,950   RIL   Corporation Facinities   Corporation	CRP	Mercury Aviation	Corpus Christi International, TX	131.600		RFD	Raytheon Aircraft Service	Rockford Airport, IL	130.575	
Piedmont Howthome Roytheon Aircraft Service Signature Flight Support Destroit Metro Wayne County, MI 122,950   SAI Piedmont Howthome Rockster, MY 122,950   122,950   SAI Signature Flight Support Rockster, MY 122,950   122,950		,			122 950					
Roytheon Aircroft Service   Sugnature Flight Support   Sugnature Flight S	DAI				122.750					
Signature Flight Support   Signature Flight Support   Control Read Reagan Washington Nat'), DC   129,000   122,950   SAT   Perdomant Howthome   Roanoke, VA   130,575   122,950   SAT   Perdomant Howthome   Roanoke,	DAL		•							
DEN   Signature Flight Support   Somald Reagon Washington Nat'l, DC   129,000   122,950   SAT   Piedmont Howthome   Som Antonio International, TX   129,175   122,950   122,950   SAT   Piedmont Howthome   Som Antonio International, TX   130,1575   122,950		Raytheon Aircraft Service	Dallas Love Field, IX	122.950		RNO	Mercury Aviation	Reno/Tahoe International Airport, NV	131.600	
DEN   Signature Flight Support   Somald Reagon Washington Nat'l, DC   129,000   122,950   SAT   Piedmont Howthome   Som Antonio International, TX   129,175   122,950   122,950   SAT   Piedmont Howthome   Som Antonio International, TX   130,1575   122,950		Signature Flight Support	Dallas Love Field, TX	130.400	130.750	ROA	Piedmont Hawthorne	Roanoke, VA	130.575	
DEN   Signature Flight Support   Denver International, CO   129.725   122.950   SAT   Predmont Hawthorne   San Antonio International, IX   129.175   122.950   SAT   Predmont Hawthorne   San Antonio International, IX   129.175   122.950   SAT   Predmont Hawthorne   San Antonio International, IX   129.175   122.950   SAT   Predmont Hawthorne   San Antonio International, IX   129.175   122.950   SAT   Signature Flight Support   Des Moines International, IA   131.000   122.950   SAT   Signature Flight Support   Des Moines International, IA   131.000   122.950   SAT   Signature Flight Support   Security Flight Support   Signature Flight	DCΔ						Piedmont Hawthorne			
DET   Signature Flight Support   Detroit City Airport, MI   129,650   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,575   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,575   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,575   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,575   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,575   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,575   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Sovannah Avardari Service   San Antonio International, TX   130,375   122,950   SAV   Signature Flight Support   Santa Burbara Avardari Service   Santa Burbara Avardari Service   Santa Burbara Avardari Service   Santa Burbara Avardari Service   Signature Flight Support   Sedemont Howthorne   Freson-Sovanite International Airport, Expertise International Airport, HI   128,950   SAV   Signature Flight Support   Sedemont Ho										100 050
Pick   Piedmont Howthorne   Knoxville, TN   122.950   SW   Savannah Aviation   Savannah International, SC   122.950   SBA   Signature Flight Support   South Barbara Muni Airport, CA   123.300   122.950   SBA   Signature Flight Support   South Barbara Muni Airport, CA   123.300   122.950   SBA   Signature Flight Support   South Barbara Muni Airport, CA   123.300   Settle Tacoma International, WA   128.925   122.950   SBA   Signature Flight Support   South Barbara Muni Airport, CA   123.300   Settle Tacoma International, WA   128.925   122.950   SBA   Signature Flight Support   South Barbara Muni Airport, CA   123.300   Settle Tacoma International, WA   128.925   122.950   SBA   Signature Flight Support   South Barbara Muni Airport, CA   123.000   SEA   Signature Flight Support   South Barbara Muni Airport, CA   123.950   Settle Tacoma International, WA   128.925   122.950   SEA   Signature Flight Support   South Barbara Muni Airport, CA   123.950   Seat Macro Muni Airport, CA   123.000   Se						SAI				
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Signature Flight Support Sonta Barbara Muni Airport, CA 123.300 Seattle/Tacoma International, NA 128.925 122.950 SA Signature Flight Support Sonta Barbara Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Barbara Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Barbara Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Barbara Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Barbara Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Barbara Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Muni Airport, CA 128.925 122.950 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA 131.500 SA Signature Flight Support Sonta Muni Airport, CA	DKX	Piedmont Hawthorne	Knoxville, TN	122.950		SAV	Savannah Aviation	Savannah International, SC	122.950	
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IAD Piedmont Hawthorne Washington Dulles International, VA 129.775 AvTech Cobb County — McCollum Airport, GA 130.175	HSV	Signature Flight Support	Huntsville International, AL	130.375	122.950	MMT0	Raytheon Aircraft Service	Adolto Lopex Mateos International, Mexico	131.700	
IAD Piedmont Hawthorne Washington Dulles International, VA 129.775 AvTech Cobb County — McCollum Airport, GA 130.175	HTO	Air Service Hawaii	Hilo International Airport. HI	128.950		VHHH	Signature Fliaht Support	Hong Kong Business Aviation Center HK	131.100	
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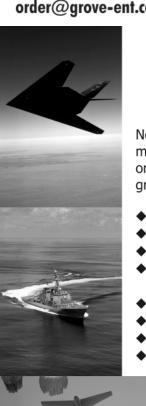


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## Utility World

## **HF Communications**

Hugh Stegman

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## **WLO Marine Radio Network**

ighty WLO, a commercial maritime station just southwest of Mobile, Alabama, has joined with two others in a Marine Radio Network (MRN). The other stations are KLB, Seattle Radio in Washington state, and WSC, Tuckerton Radio, which is north of Atlantic City, New Jersey.

While lacking the planetary scope of such giants as Globe Wireless, the MRN fills a niche that is attractive to smaller vessels in North American waters. It accepts commercial ship traffic in a large number of modes and formats for voice and teleprinted communications.

The digital modes use a computer and radio modem (modulator-demodulator) connected to a slightly beefed-up and tricked-out marine upper-sideband (USB) transceiver. Superficially anyway, these popular and relatively inexpensive setups resemble modern ham radios, and they are made by many of the same companies.

#### MRN Telex and E-Mail Services

MRN accepts the traditional ship Telex (radiogram messages) in SITOR (Simplex Teleprinting Over Radio). It also allows the use of AMTOR (an amateur radio SITOR clone), and PACTOR (Packet Teleprinting Over Radio). PACTOR is a relatively new mode, invented by German hams who subsequently went into business as Special Communication Systems (SCS).

PACTOR I, the slowest version, uses an internationally recognized 1700 hertz (Hz) audio center, with a shift plus and minus 100 Hz, and a speed of 100 or 200 baud. In bad conditions, the resending of lost data packets can slow PACTOR I down to an agonizing crawl. PACTOR broadcasts are possible, but most features use Internet-style connections, mailboxes, and file transfers.

WLO's initial PACTOR connections can be decoded with hobby-class equipment or software. However, things get a lot tougher once the contact switches to PACTOR IIe. This newer, faster system is a total rethinking of PACTOR, and it makes an amazing number of different noises as it adapts to band and interference conditions. PACTOR IIe decoders are available to

PACTOR-4 PACTOR-II SCS PTC-IIe Connected Send PT OUR'S OUR'S

hobbyists, but at US\$650 and up this is not a casual investment. Also, there is still no readable copy from encrypted or compressed files.

Although SITOR allows simplex operation, where stations very rapidly alternate on a single frequency, in practice it nearly always uses the paired, duplex channels allocated by the International Telecommunications Union. The ship transmits on the lower of the pair, and the shore on the higher. You've probably heard the earsplitting bursts, followed by Morse code identifiers, from WLO and other high-powered coastal stations. The high-pitched, screeching sound is for SITOR sync. The lower-pitched gurgle is something similar for PACTOR, or for its many proprietary variants used in such higher-priced systems as GlobeData.

MRN also allows e-mail and file transfers on several maritime simplex telegraphy frequencies. Internet e-mail at sea is fairly new, but it's coming into extremely wide use. This particular mode greatly resembles the mailboxes being offered by SailMail, PinOak, and several others.

Things get a bit tricky here, since USB radios use audio frequency shift keying (AFSK) instead of true FSK telegraphy. This places the center of the actual PACTOR signal 1.7 kilohertz (kHz) higher. Therefore, many transmitters will read this much lower than the listed channel center when they are actually on-frequency. Similarly, most USB receivers will have to be tuned 1.7 kHz HIGHER than the listed frequency. This can really confuse people. Often it's easier to just do it than to try and think about it too much.

Interestingly enough, all this offsetting tends to put the filtered USB carrier outside of the channel, making it a spurious emission under regulations and requiring its greater suppression than what would otherwise be necessary. The use of out-of-band ham radios, though common in some countries, is strongly discouraged in favor of type-accepted marine transceivers.

#### Voice Radio Services

Recently, WLO has begun calling itself the "Water to Land Operator." This undoubtedly refers to its position as the sole remaining high-seas public ship-to-shore radiotelephone vendor in the United States.

Your editor has actually heard vessels placing phone calls, just like on the old stations that AT&T closed a couple of years ago. Yes, terrestrial ship telcom survives in the US, though traf-

fic is obviously a tiny fraction of what we heard in the pre-satellite glory days. Voice message traffic is also taken.

With the coming of hurricane season, WLO's voice weather bulletins become important. This year, tropical forecasts for the Gulf are broadcast at 1200, 1600, and 2200 Coordinated Universal Time (UTC). Atlantic forecasts are at 1205, 1700, and 2300. Caribbean weather is at 1210, 1800, and 0000.

If hurricane conditions warrant, additional broadcasts are made on the hour. Interestingly, registered PACTOR users can connect to any MRN station, at any time, and download the various National Hurricane Center products. These include the Atlantic and Pacific tropical cyclone advisories, and Atlantic hurricane strike probabilities.

#### **MRN USB Voice Channels**

Assigned Carrier Frequencies

\* = Shore side broadcasts weather

Silvio sido Biodatasis ilodino:			
ITU #	Ship	Shore	
405*	4077.0	4369.0	
419	4119.0	4411.0	
607	6218.0	6519.0	
824*	8264.0	8788.0	
830	8282.0	8806.0	
1212*	12263.0	13110.0	
1226	12305.0	13152.0	
1607	16378.0	17260.0	
1641*	16480.0	17362.0	
1807	18798.0	19773.0	
2237*	22108.0	22804.0	
2503	25076.0	26151.0	

#### **MRN Telex Pairs**

Assigne	d Channel Centers	
ITU#	Ship	Shore
406	4175.0	4213.0
606	6265.5	6317.0
806	8379.0	8419.0
810	8381.0	8421.0
1205	12479.0	12581.5
1215	12482.0	12584.5
1605	16685.5	16809.0
1615	16690.5	16814.0
1810	18875.0	19685.5
2215	22291.5	22383.5
2515	25180.0	26108.0

#### MRN Simplex E-Mail

Assigned Cho	annel Centers ases is +/- 100	
À256.	6416.0	8473.0
8514.0	12886.5	13051.5
16997.5	22688.0	



Hugh Stegman

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#### Abbreviations used in this column

**ACARS** Aircraft Communications Addressing and Reporting System

AFB Air Force Base

ALE Automatic Link Establishment

ARIA Advanced Range Instrumentation Aircraft ARQ Automatic Repeat Request teleprinting system

**ASECNA** Agence pour la Securite de la Navigation Aerienne en Afrique et a Mada-

gascar Continuous Wave (Morse telegraphy) CW

DX Distant Transmitter

EAM **Emergency Action Message** 

FAX Radio facsimile

**FEC** Forward Error Correction teleprinting system

**FGS** Federal German Ship

FS French Ship

**GHFS** Global High Frequency System HFDL High Frequency Data Link

Lower Sideband LSB

M8a Cuban CW, ANDUWRIGMT for 1-0, 3 messages

M10a Czech CW numbers in 3-figure groups MARS Military Affiliate Radio System Meteorological (weather office) Meteo

MFA Ministry of Foreign Affairs NAVTEX Navigation Text

**PACTOR** Packet Teleprinting Over Radio **RSA** Republic of South Africa

RTTY Radio Teletype SAM Special Air Mission

SITOR-A Simplex Telex Over Radio, ARQ mode SITOR-B Simplex Telex Over Radio, FEC mode

UK United Kingdom Unid Unidentified US United States

V2a Cuban numbers, 3 messages, begins "Atencion"

VOLMET Flying Weather (loosely from French)

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations (encrypted, usually unidentified, broadcasts thought to be intelligence-related) are identified in () with their ENIGMA station designators, as issued by the European Numbers Intelligence Gathering and Monitoring Association.

- 490.0 Cullercoats Radio, UK, with weather in SITOR-B, at 0720. (Day Watson-UK)
- 518.0 "B"-NAVTEX station, Bodo, Norway, with SITOR-B bulletins at 0010. "T"-NAVTEX, Cagliari, Italy, SITOR-B, at 0010. Also D, Istanbul, Turkey, at 0030; H, Jeddah, Saudi Arabia, 0110; K, Kerkyra, Greece, 0140; L, Limnos, Greece, at 0150; M, Cyprus, at 0200; N, Alexandria, Egypt, 0210; R, Monsanto, Portugal, 0250; O-Malta, 2220; C, Odessa, Ukraine, 2230; and U, Tallinn, Estonia, at 2320. (Ary Boender-Netherlands)
- SPB28-2045 Szczecin Radio, Poland, telling a ship in SITOR-A to "type or quit please," at 2047. (Watson-UK)
- 3167.0 "E-1-Q"-Unknown military, telling an unid station to use frequency "Thunder" for data, at 0132. (Ron Perron-MD)
- 4166.0 KPA2-Israeli Intelligence, AM callup only (E10a), at 2217. (Boender-Netherlands)
- Cuban "Atencion" numbers station (V2a), machine-generated 4479.0 Spanish-speaking female voice, with three messages in AM at 0300. (Camillo Castillo-Panama) Cuban station, usually the voice "numbers," this time with the right message format, but in Morse code (like M8a), at 0300. (John Maky-AR) [Do we need any more proof that V2 and M8 use the same transmitters? -Hugh]
- 4525.0 5ST-ASECNA, Antananarivo, Madagascar, with RTTY weather (400/100), at 1615. (Bob Hall-RSA)
- Panther-US Drug Enforcement Administration, Bahamas, work-5277.0 ing Coast Guard 63A in a drug operation, at 0245. (Perron-
- 5862.5 Unid-US Navy MARS, calling NNN0DWF and NNN0DWG (region four group calls), in slow PACTOR at 1018. (Mid-Atlantic DXer-MD)

- 6091.0 Cuban "Cut" numbers station (M8a), with three CW messages at 1200. (Castillo-Panama)
- 6496.5 CFH-Canadian Forces, Halifax, Meteo center with RTTY weather observations, alternates with hourly FAX, at 0431. (MADX-MD)
- 6622.0 US Air 334, giving position to Gander at 0440. (MADX-MD) 6697.0 Abstainer-US military, probably U.S. Strategic Command, with
- EAM at 0615. (Jeff Haverlah-TX)
- Andrews-US Air Force, MD, working Foot Hill, who had come 6730.0 from 8040, and was then sent to 9023, at 0500. (Haverlah-TX)
- 6754.0 CHR-Canadian Forces, Trenton Military, with weather VOLMET at 1024. (MADX-MD)
- Reach 7043-US Air Force transport, coordinating mid-air refu-6761.0 eling with Air National Guard tanker Maine 87, discussed fuel amount and weather, at 0123. (Jim Ashe-MA)
- 6795.0 Cuban "Cut" numbers station (M8a), with three CW messages at 1200. (Castillo-Panama)
- Unid-CW "numbers" with 555 callup (M10a), at 1630. (Boender-Netherlands)
- 6844.0 FDC-French Air Force, Metz, with a CW marker at 0434. (MADX-
- 6853.0 Cuban "Cut" numbers station (M8a), with three CW messages at 1200. (Castillo-Panama)
- Cuban "Atencion" numbers station (V2a), with three AM mes-6855.0 sages at 0300. (Castillo-Panama)
- 6911.5 DUST-US Army or National Guard, sounding in ALE at 0436. (MADX-MD)
- 6981.0 Cuban "Cut" numbers station (M8a), with three CW messages at 1300. (Castillo-Panama)
- 7740.0 DEPM-Possibly Moroccan Ministry of Information, sounding in LSB ALE, at 1920. DG, LSB ALE, sounding at 1923. DEPT, LSB ALE, sounding at 1927. (Watson-UK)
- 7893.5 B4CHU-Hungarian station in Combined Endeavour 2001, testing PACTOR, USB, ARQ, and FEC with N6NGE (CIS Georgia), at 1610. (Boender-Netherlands)
- 7919.0 Spar 66-US military, working Metaforce for a patch, at 1414. (Boender-Netherlands)
- 8156.0 "Capetown Control"-Net control station in RSA, for the fleet in the British Telecom Around-The-World Yacht Race, passing weather observations at 0610. (Hall-RSA)
- 8779.0 ZSC-Capetown Radio, RSA, working US Coast Guard Cutter Sherman, which had just rescued and towed in a 33,000-ton auto carrier, at 0633. (Hall-RSA)
- 8906.0 Air Canada 3040-Scheduled flight with position for New York Radio, at 0343. (Brent Davenport-CO)
- 004-Aeronautical Radio, Incorporated, New York, passing data 8912.0 in the new High Frequency Data Link mode, at 0717 and 0803. (Watson-UK) [Looks like ARINC's HFDL, which is a bit like the "ACARS" on higher bands, is finally up and going. –Hugh
- 007-Aeronautical Radio, Inc., Shannon, Ireland, with HFDL data at 1940. (Watson-UK)
- 003-Aeronautical Radio, Inc., Reykjavik, Iceland, with HFDL at 8977.0 1931. (Watson-UK)
- Puerto Rico-US Air Force GHFS, Salinas, PR, sending Foot Hill 8992.0 (unheard) to a discrete frequency of 8040 kHz, where Foot Hill worked Andrews, who sent him to 6730, all at 0455. (Haverlah-
- 9007.0 Sigonella-US Air Force, new Global station, with EAM at 0100. (Perron-MD)
- 9016.0 Ownership-US military, with an EAM in a new format where they give the character count, simulcast on 8992 and 11244, at 0020. (Haverlah-TX)
- Andrews-US Air Force, MD, working Foot Hill, who had come 9023.0 from 6730, and was sent to 9120 after asking for a duplex data frequency, at 0503. (Haverlah-TX)
- 9120.0 Andrews-US Air Force, MD, working Foot Hill, who had come from 9023, then both stations stepped on by a US Navy link-11 tracking data link, and gone, at 0515. (Haverlah-TX)
- HLL-Seoul Meteo, Korea, with a FAX satellite weather picture, 9164.9 poor quality, at 1903. (Watson-UK) Cuban "Atencion" numbers station (V2a), with three AM mes-
- 9260.0 sages at 0200. (Castillo-Panama)

## **Utility Log**



- 9265.0 Cuban "Atencion" numbers station (V2a), with three AM messages, twice at 0200. (Castillo-Panama)
- 10155.0 BVG- Probably Chilean Navy, calling unknown station in LSB ALE, at 0005. (MADX-MD)
- 10192.5 DHJ 59-German Navy, with voice and RTTY for DRET, Mine Hunter FGS Rottweil, went to 6779, at 0012. (Perron-MD)
- 10215.0 HZN48-Jeddah Meteo, with RTTY weather (850/100), slightly off frequency and with rough notes, at 1515. (Watson-UK)
- 10608.0 Shark 24-US Coast Guard Cutter Steelhead, trying to set up secure voice with Coast Guard Group Miami, at 0001. (Perron-
- 11104.0 N140SC-Heavy L-1011, practicing a Pegasus orbital drone launch on the Eastern Test Range, working ARIA aircraft, also on 10780 with Cape Radio, at 1640. (Allan Stern-FL)
- 11105.0 116-Possible Chinese diplomatic, working 191 in ALE, at 1908, and working 198 in ALE and data modes at 1946. YT362A-Possibly Chinese, calling ZT201A in ALE, at 1948. (Watson-UK)
- 11122.0 Unid-US Air Force Global Weather Center, sending a weather FAX with no image, either encrypted or another of those black raster things, at 1020. (MADX-MD)
- 11149.0 GYU-UK Royal Navy, Gibraltar, with RTTY test markers at 0656. (Watson-UK)
- 11175.0 Ops 19-Possible call sign of US military aircraft patching McCord AFB via Hickam Global, requesting diversion for an icing problem, at 0346. Earl 27-US military, with a patch to Fairchild Meteo via Andrews Global, at 0359. (Davenport-CO)
- 11232.0 Trenton Military-Canadian Forces, in radio check with CANFORCE 3205, at 2142. (Perron-MD)
- 11244.0 Fletcher-US Strategic Command, sounding like the control in the old Nightwatch net, asking Map Tack if he'd talked to Assorted, at 0044. (Haverlah-TX)
- 11246.0 "15"-Partial call sign of a US military aircraft calling MacDill, a station that closed years ago, on a frequency they haven't used since 1992 anyway, at 1736. (Haverlah-TX) 11253.0 Royal Air Force, UK, with VOLMET weather at 0452. (MADX-
- 11429.0 GBR-Probably Chilean Navy, working KJD in LSB ALE and Skyfax, at 2340. (MÁDX-MD)
- 12478.0 UCNJ-Russian vessel Igor Grabar, located off Portugal, passing weather observations to Arkhangelsk in SITOR-A, at 1835. (Watson-UK)
- 12525.7 Unid-Vessel on a frequency used by Indian ships, with ARQ messages in English to Mumbai, at 1650. (Hall-RSA)
- 12746.0 JJC-Tokyo Radio, Japan, with a FAX newspaper in Japanese, 60/576, at 0830. (Hall-RSA)
- 12815.0 LYL-Klaipeda Radio, Lithuania, with a CW traffic list and info, at 1000. (Watson-UK)
- 12851.0 SAB-Globe Wireless Goeteborg, Sweden, working a ship in Globedata, then back to sync markers at 1508. (Watson-UK)
- 13276.0 004-Aeronautical Radio, Inc., New York, with HFDL data traffic for several stations, at 1857. (Watson-UK)
- 13440.0 SAM 204-US Air Force Distinguished Visitor flight, working Andrews AFB, MD, inbound from Bogota, Colombia, made patches to SAM Command and Andrews Meteo, at 2134. (Haverlah-TX)
- 13882.5 DDK6-Hamburg Meteo, Germany, with FAX weather charts at 1042. (MADX-MD)
- 13920.0 AXM35-Canberra Meteo, Australia, with weak FAX chart at 0908. (MADX-MD)
- 13961.5 HBD46-Swiss Embassy, Havana, Cuba, with an hours-long SITOR-A message in 5-letter code groups, at 1105. (MADX-WD)
- 14358.0 Unknown-Net control station, passing Azores weather observations with many small vessels in the British Telecom yacht race, in English and Portuguese, at 2231. (MADX-MD)
- 14366.9 BAF8-Beijing Meteo, China, with weak FAX weather charts at 0847. (Hall-RSA)
- 14718.3 RFHI-French Forces, Noumea, with two coded ARQ messages on circuit "HIJ," at 1138. (MADX-MD)

- 14719.0 OST53-Oostende Radio, Belgium, giving mailbox instructions to an unknown ship in SITOR-B, at 1041. (MADX-MD)
- 15016.0 Sigonella-New US Air Force GHFS station, with two EAMs at 1632. (MADX-MD)
- 15025.0 LH8273-Aircraft with position and data for Reykjavik, in HFDL at 1604. LH8183, HFDL position at 1605. LH8189, HFDL position at 1606. LH8273, in HFDL at 1613. LH8420, with an ACARS link test, identified self as D-ALCG, at 1631. (Watson-UK)
- 15851.0 FAAZLA-US Federal Aviation Administration, Los Angeles, sounding in ALE at 1309 and 1409. FAAZMA, Miami, sounding at 1334. FAAZMP, Farmington, MO, sounding at 1342. FAAZFW, Fort Worth, TX, sounding at 1410. (MADX-MD)
- 15873.0 P6Z-French MFA, Paris, with encrypted and clear FEC messages for an unknown station in Europe, at 1052. (MADX-MD)
- 16087.7 RFVI-French Forces, Le Port, with several ARQ messages on circuit "REI," at 1117. (MADX-MD)
- 16105.0 S84-Swedish Embassy, Washington, DC, working S12, Bogota, in ALE and data modes, at 1153. (MADX-MD)
- 16120.0 GYU-UK Royal Navy, Gibraltar, with RTTY marker (810/75), at 1917. (MADX-MD)
- 16127.0 DHJ 58-German Navy, Glucksburg, working DRKH, FGS Meersburg, English and German, at 0019. (Perron-MD)
- 16181.0 S86-Swedish Embassy, Mexico City, working S91, Lima, Peru, in ALE and data at 0009. (MADX-MD)
- 16183.0 CA2- Probably Chilean Navy, working unknown station in LSB ALE, at 0001. TAC calling ASI in LSB ALE at 0002. (MADX-MD)
- 16316.0 Polish Embassy, Kinshasa, Zaire, signing with an unknown station in ARQ, at 0852. (Hall-RSA)
- 16326.0 NWKHF1-US Army Corps of Engineers, Kansas City, sounding in ALE at 0123. (MADX-MD)
- 16544.0 Radgena-Colombian Navy, working Turbo (Coast Guard Headquarters), in ALE and CLOVER2000 modes, at 0049. (MADX-MD) [CLOVER2000 is an 8-tone, high-speed version of the 4tone Clover digital mode used by hams. -Hugh]
- 16812.5 NRV-US Coast Guard, Guam, with CW markers at 1558. (Watson-UK)
- 17555.0 SUN5-Sunair Electronics, Ft Launderdale, FL, sounding in ALE, at 1539. (MADX-MD)
- 17928.0 006-Aeronautical Radio, Inc., Hat Yai, Thailand, with HFDL at 1612. (Watson-UK)
- 17934.0 002- Aeronautical Radio, Inc., Hawaii, with HFDL at 1840. (Watson-UK)
- 18220.0 JMH5-Tokyo Meteo, Japan, with FAX weather charts, fading, at 1057. (MADX-MD)
- 18320.7 RFFIC-French Navy, Paris, with ARQ messages for AIG2135 and RFFXOC (French Army, Paris), at 1245. (Hall-RSA)
- 19131.0 ATLAS-US Drug Enforcement Agency, IA, working Flint 411, at 1504. (MADX-MD)
- 19692.5 ZSC-Capetown Radio, with SITOR-B weather bulletins at 0930. (MADX-MD)
- 20338.0 CENTR5-Romanian MFA, working Z2H98, Romanian Embassy, Harare, with ALE calls back and forth but no connection for traffic, at 1706. (MADX-MD)
- 20698.0 S32-Swedish Embassy, Kuwait, sounding in ALE at 0004. S00-Swedish MFA, Stockholm, working S53, Amman, Jordan, in ALE-initiated data at 1613. (MADX-MD)
- 21949.0 008-Aeronautical Radio, Inc., Johannesburg, RSA, with HFDL at 1218. (Watson-UK)
- 22374.0 Unid-African bank station, with RTTY financial traffic for Odessa, at 1610. (Hall-RSA)
- 23522.7 JMH6-Tokyo Meteo, with a clear FAX chart at 0837. (Hall-RSA)
- 26441.7 RFFMVB-French Navy, Toulouse, with ARQ Indian Ocean cyclone warnings addressed to RFFINDI (FS Alindien), RFFKO (partial routing), RFVIGRN (FS Garonne), RFVIFLR (FS Floreal), RFFLAAC (unknown), RFFLADL (FS Dupleix), RFFLAYE (FS Lafayette), RFFKMPP (CEW; vessel name unknown), and RFFKAVL (FS LDV Lavallee), all on "REI" circuit, at 1525. (Hall-RSA)



## **Digital Digest**

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&

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## Mysteries Solved, More ALE Networks, PACTOR

his month we provide some news about the US Coast Guard's networks which appear to have solved a few of our long-standing logbook mysteries. We also update a few of the networks covered in our ALE Feature in the February issue of *MT*, and take a more detailed look at the popular PACTOR system.

#### US Coast Guard

Prompted by a message to the WUN (Worldwide Utility News) from Mark Chinsky about the location and origin of the 75bd/170 Hz encrypted RTTY signal occupying 11436 kHz, Larry Van Horn confirmed this as belonging to the US Coast Guard's "Eastern Pacific HF Radioteletype" network.

Our interest went a little further since we had long suspected that the signal on 11436 kHz had siblings elsewhere. Most users of the Hoka gear know that there is a precision baudrate measurement feature accessible by pressing the "R" key when checking a signal with the spectrum analysis tools. This feature can measure the speed of a signal to four decimal places, which is very useful for "fingerprinting" purposes.

Having seen 75bd/170Hz signals on other

Having seen 75bd/170Hz signals on other frequencies, we had previously used this capability and determined that many of the suspected related signals measured the exact same speed – 74.9832bd – indicating that they are all probably derived from the same source.

Checking Larry's list helped us confirm that the mysterious signals were indeed from the same source – the US Coast Guard. Here are those 75bd/170 Hz channels we found:

5214, 5219, 5221, 9371, 11436, 13948, 18245 and 20135 kHz
And, here's Larry's complete list of USCG
"A1401 Network" frequencies for comparison:
2016.0 2040.0 2054.0 4913.5 5108.5 5217.0 5223.0
5266.0 5272.0 5419.5 5942.5 6961.0 7439.0 7577.0
7617.0 7626.0 7754.5 7845.0 7884.0 7909.0 9169.0
9291.0 9332.0 9373.0 10297.5 10338.5 10354.5 10378.0
10675.0 10759.0 10788.0 10929.5 10935.5 11024.0
11045.0 11157.5 13413 13484.0 13537.7 13950.0
14506.0 14518.75 14731.0 14752.0 14919.2 18189.0
18255.0 18283.0 18335.0 18497.0 18650.0 18716.0
20095.0 20137.0 20518.0 20639.0 23373.0 23515.0
Atlantic Only: 2161.0

Pacific Only: 2144.0 5932.5 7713.0 9299.5 11165.8 18757.0

Looking at the list also helped solve another mystery. Since being able to decode the MIL-188-110A 2400bd HF modems, we had noticed at least 20 channels carrying the same KG84 encrypted traffic, always being sent at 600bd and with a short interleave. We are now sure that a large number of these transmissions are also USCG. Here are those 110A channels. These also make excellent places to listen to a 110A modem if you've not yet heard one:

4156.0 5105.5 5193.5 6961.0 6996.5 7751.5 7845.0 8307.0 8328.0 9166.0 10294.5 10343.0 10378.0 10756.0

10788.0 10932.5 11021.0 12372.0 12384.0 12390.0 13481.0 14752.0 14919.2 16550.2 20092.0

#### ALE Update

After some in-depth research, we appear to have uncovered the organizations behind a number of the networks featured in the February 2001 issue of MT.

#### "CGE, CLC, CRC, SCLM" Network is Venezuelan Army

We had originally listed these identifiers as a sub-network belonging to the Canadian Forces. Despite sharing at least two channels with the Canadians, it's now pretty likely that this network is in fact the Venezuelan Army. See the Resources section for a profile of this network and the clues that point to the user.

#### "VFO, TAC" Network is Chilean Navy

Some extensive monitoring of this unidentified network by Leif Dehio eventually yielded some operator chatter that instructed one of the stations to relay a message to CCS. From previous operator chatter, we knew that the network was probably South American, and with CCS being the callsign of the Chilean Navy in Santiago, we're now reasonably sure that this is indeed the operator of this network. See the Resources section for a profile of this network.

#### ◆ Taiwanese Navy Network

This network came to prominence during a recent "goodwill tour" to a number of South and Central American countries. It operates on the following frequencies (all LSB, although USB has been noted):

8672.0 10827.0 12026.0 13850.0 14360.0 16000.0 17418.0 18035.0 19180.0 21860.0

Identifiers, which change every day or so, are always four letters, for example:

AMNP CJXH DEVC DFNM DOJC SFDJ As a reminder, you can check for the latest details on ALE Networks by visiting Utility Monitoring Central's ALE Networks page.

#### System Profile: PACTOR

A very effective digital system, and successful in making the transition from amateur radio to commercial operations, PACTOR has developed considerably since its introduction in the mid 1980s.

As its name suggests, PACTOR combines both packetized data and SITOR (automatic repeat request) techniques to achieve high efficiency and throughput.

The original system is, or has been used by amateurs, US Forces MARS stations and many quasi-governmental organizations. It is FSK-based and provides 100bd or 200bd speeds with a shift of 200 Hz.

Commercial adoption of the system warranted the development of many mutually incompatible variations with changes made to the packet structure to support the privacy requirements of the various quasi-governmental users – so-called "bit-bashing." The Hoka series of decoders supported at least seven of these variations:

Pactor 1	Amateur	PACTOR
Pactor 2	International Red Cross	PACTOR-11
Pactor 3	UN Commission for Refugees	PACTOR-U
Pactor 4	International Federation of Red Crosses	PACTOR-12
Pactor 5	Unidentified	PACTOR-5
Pactor 6	Unidentified	PACTOR-6
Pactor 7	Unidentified	PACTOR-7

The success of the original version of PACTOR resulted in the development of PACTOR-II which is DSP-based and is as much as eight times faster than PACTOR-I.

A PACTOR-II signal features two tones with 200 Hz shift using baud rates of 100 or 200 fitting into a 500 Hz channel. PACTOR-II is a half-duplex synchronous ARQ system and designed to be backward compatible with the original PACTOR-I protocol. The system can handle raw 8 bit data and ASCII compression.

More importantly with PACTOR-II, depending on band conditions, the data throughput can be increased by changing the modulation form used from FSK to PSK. These speed changes happen transparently to the user, which is called "adaptive" behavior. Maximum throughput is 800 bps using the following modes:

DBPSK	(Ditterential Binary PSK)	200 bps
DQPSK	(Differential Quad PSK)	400 bps
8-DPSK	(8-phase Differential PSK)	600 bps
16-DPSK	(16-phase Differential PSK)	800 bps

Many users of the original system have also transitioned to the new modem including Medecins sans Frontieres, UN affiliates, US Coast Guard and many of the commercial HF email services (SailMail, Globe Wireless, Pin Oak Digital) also use PACTOR-II, or variants.

That's all for this month.

#### Resources

#### **Venezuelan Army:**

 $http://www.mindspring.com/{\sim} mike.chace/mil/army/Venezuel.txt$ 

#### **Chilean Navy:**

www.mindspring.com/~mike.chace/mil/navy/Chile.txt

#### **Taiwanese Navy:**

www.mindspring.com/ $\sim$ mike.chace/mil/navy/Taiwan.txt

#### PACTOR-I Audio Clip:

rover.vistecprivat.de/~signals/WAV/PACTOR-200.WAV

#### **PACTOR-II Audio Clip:**

rover.vistecprivat.de/~signals/WAV/PACTOR-II.WAV



# **Shortwave Broadcasting**

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# **Changes In U.S. Government International Broadcasting**

The US Government notified Spain that the Playa de Pals transmitting station would close May 25. It had a long and distinguished history, playing a critical role in bringing objective news and information to the people of the former Soviet Union (FSU) with Radio Liberty, later RFE and VOA. In an IBB press release via Kim Elliott, this explanation was given:

Today, the ability of newer and different media and the availability of other transmitting locations to reach the FSU, along with development of democratic institutions and market-based economies in the region, have significantly diminished the utility of the Playa de Pals station as a U.S. Government broadcasting facility to the point where its continued broadcast operations can no longer be operationally or financially justified.

All programs transmitted from Playa de Pals were moved to other sites; with very few exceptions on the same frequencies, says Dan Ferguson of IBB, so most listeners would not even notice.

*Pravda* reported: Townspeople are enthusiastic about the news after the residents of houses around the station were uneasy for many years with radiowaves' bad effect. They are also glad to have a large Mediterranean coastal strip back after the station is dismantled with prospects to use another plot for tourism, one of the principal sources of local revenues (via Mike Terry)

Radio Free Asia has been heard via a "mysterious" transmitter on 11605, says Olle Alm, Sweden, in Cumbre DX. With good East Asian signals, he could easily identify the transmission before 1400 as RTI Japanese with several IDs and the CBS URL from Taiwan. The carrier went off at 1400.00 and returned after 40 seconds with RFA Vietnamese program. The offset was about +260 Hz, exactly the same before and after the break. So there is no doubt that RTI is now used by RFA. This was probably arranged thru Merlin. One wonders if the Taiwanese would dare to broadcast RFA in Chinese languages.

Herminio San Román, Director of Radio and Television Martí, has announced that he will step down on 27 July, reports Media Network via John Norfolk. That's the day after Cuba's national holiday.

From the Crisis at Radio Marti website via Mike Terry, BDXC-UK, http://www.cubapolidata.com/carm/carm 01 newsflash.html:

OCB Director Herminio San Román was forced to resign because Congressman Lincoln Díaz-Balart (R-FL) faced insurmountable political pressure from exile leaders. San Román has told members of his inner circle that he was betrayed by Congressman Díaz-Balart because did not deliver on his promises of political influence that would protect him. Also, pending Congressional legislation seeks to abolish the Martís: (H.R. 1646).

Outgoing VOA Director Sandy Ungar has been working on a project to modify the format of VOA News Now, which was too repetitive with news. From mid July there would be more music, cultural items and softer news. Details were sketchy until arrangements could be worked out with unions, as reported on VOA Communications World via Chris Hambly.

Andre de Nesnera, with the VOA for 20 years, has been selected as VOA News Director. Andre is fluent in English, Russian, and French, and he has a solid command of German. Before coming to VOA, Andre worked for CBS News and WMCA Radio in New York, per Sandy Ungar, VOA Director, via Kim Elliott.

Effective July first, the Broadcasting Board of Governors has asked Myrna Whitworth, currently VOA Program Director, to serve as Acting Director of the Voice of America. A long time VOA employee, Myrna also served in a number of managerial positions within VOA's News and Worldwide English Divisions and was the Executive Producer of World Report and other English news programs. Myrna previously served as Acting VOA Director from March to June 1999.

Kelu Chao, currently Director of VOA's East Asia and Pacific Division has been named Acting Program Director and will manage the daily operations of the Voice of America. Kelu has been with VOA for over twenty years.

What has become of the ex-VOA Bethany site? David Walcutt and Dan Ferguson draw our attention to this on the SWBC list: http://cnniw.yellowbrix.com/pages/cnniw/ Story.nsp?story id=21454536&ID=cnniw Meanwhile, Bethany's most outspoken employee, John Vodenik, says he is going back to work for IBB, at Delano.

out of their way to present a variety of frequency offsets (gh)

ANGOLA Rádio Nacional, Luanda, 4950, reactivated as unheard there for some time, Portuguese 2140 to 2200, large signal (Bob Padula, EDXP) 4950 at 0300, Portuguese pops, ballads, news at hourtop, \\ 11955.8; both fair, also at 2315 (Brian Alexander, PA, DX Listening Digest) 11955.8 from 2330 Portuguese talk and music to 0200 fade-out, brief PT news at 0000 and 0100; strong signal, back after long absence, 2 kHz higher than before (Ernie Behr, Ont., DXLD)

AUSTRALIA Drove past the Radio Australia transmitting station on Verney Road, Lemnos (known as Shepparton – actually 8 km north of Shepparton) and noted that in the past few years there has been extensive work done on feeder lines, replaced and enclosed in shielded ducting. Looks very good. The old feeder lines have long since seen suspected of causing intermod products that have been heard in Sydney at S9+ levels (Ian Baxter, ARDXC)

BRAZIL R. Senado began broadcasting on SW May 21, covering N, NW and WC Brasil (Agência Brasil via Célio Romais) 5990 from fade-in 2050 past 2220, rare to hear Brazil in this time period (Bob Padula, Victoria) Same program as on FM, live Senate coverage, plenary and commissions, Brazilian music. A newscast especially for the above regions is at 1045; on the air from 1000 to 0200 (from http:/ /www.senado.gov.br via Romais) Transmitted from Brasília with 250 kW Brown

Boveri, 18 dBi gain, 344 degree azimuth, says Aldo Renato Bernardes de Assis, maintenance engineer (Samuel Cássio Martins Santos, @ividade DX)

R. Globo, Rio, 11805 simulcasts Tarde Legal with Globo São Paulo 6120 and 9585, heard at 1508 (Samuel Cássio, DX Clube do Brasil) 5035.28, Radio Aparecida, at 0135 Portuguese religious service, measured on

creating a new QSL card; also plans to ID in Spanish and English at night; they are even returning IRCs and dollar bills sent with reception reports. Also is hurrying to

5035.28, 6135.11, 9630.19 and 11855.26 (Mark Mohrmann, VT) Wow, they go

R. Dif. Taubaté is rendering special treatment to DXers reporting 4925, raise power from 1 to 5 kW and improve antenna. Address is Rua Dr. Souza Alves, 960 12020-030 Taubaté-SP BRASIL (Samuel Cássio, DXCB, radioescutas)

BULGARIA I tuned into Eurosonor Radio 6900 at 1605 only to find they were playing a Radio Ezra tape. This stopped after a couple of minutes and then Eurosonor Radio started; proves they are coming from the same site as we had assumed (Mike Barraclough, UK) Eurosonor also on 20700, 3 x 6900 at 1600. Then moved to 9980 (Roberto Scaglione, Italy, BCL.News.IT via hard-core-dx) Only on Sundays, 1600-1700 in German. Reports highly welcomed at radio@urorsonor.de and will be verified by new QSL card. In a few weeks they would also start new service to Americas in Énglish, Spanish, German (Harald Kuhl, Germany, NU)

13850, R Ezra, quite good Sunday \*1100-1115\*, but the recorded sound was not always easy to understand. A plug for http://www.transmitter.org at the beginning; apparently the Belgian animator of that site arranged this. Sounds

like an expensive hobby. Religious talk; most of the small pieces were quite literate and coherent, but the overall point wasn't clear (John Campbell, UK, NU via BC-DX) Another Sunday 13850 kept breaking down 1050-1115 (Wolfgang Büschel, Germany, DX Listening Digest)

CANADA Drastic cuts at RCI: Complete info available at http://www.geocities.com/rciaction - All RCI programs in all languages reduced to 30

All times UTC; All frequencies kHz; \* before hr = sign on, \* after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd har-

monic; A-01=summer season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated

- English and French weekend programs will re-run after the 30-minute program on weekdays.
- No news on weekends from RCI, but CBC.
- Foreign language services will have NO NEWS AT ALL on weekends

 More changes due in October (Ricky Leong, swprograms)
 Then it was announced June 12 that RCI Executive Director Robert O'Reilly has retired! He is being replaced by a CBC insider, from the Radio-Canada French language domestic network. Also interesting to note that the replacement's title will be "General Manger" and not "Executive Director."

Perhaps O'Reilly did his job too well, making RCI possibly more efficient; something that CBC administrators just couldn't swallow. I have a feeling that perhaps CBC tried to implement changes to try to destroy some of the things that O'Reilly was able to accomplish in his term as Director. I am sick and tired of the meddling of CBC in the operations of RCI, and I want people to know it. I think it is time we called a spade a spade. This is nothing more than the beginnings of a full-fledged, all out attack on RCI, with the ultimate goal of complete absorption of RCI into the ranks of CBC. I've had enough and I'm going all out to scream it from the rooftops. Hopefully somebody with the power to stop these people will be listening (Sheldon Harvey, QU, DX Listening Digest)

CFVP, Calgary, 6029.95, at 0000 with oldies format, improving until Martí carrier at 0059, then still audible with CKMX ID; also at 2141 (Walt Salmaniw, Victoria, BC, DXLD) 6030 CFVP nice at 0307 UT Monday when Martí is off (Hans Johnson, WY, Cumbre DX)

CHNX on 6130 was remarkably loud at 0231 with CHNS Weather Center" "Oldies 96 CHNS" (Tom Read, UK, BDXC-UK) 2200 announcing its e-mail address as chnx@chnsradio.com (Charles F. Washburn, ME, ODXA)

Back after lightning strike put it off for a while; just 41 watts; 500 watt CKZN 6160 received only slightly better (Noel R. Green, UK, BC-DX) Fair in USB but frequent drop-outs mid-song at 0801 (Craig Seager & John Schache, Limekilns NSW DXpedition, ARDXC)

- CHECHNYA R. Kavkaz ("R. Caucasus"), I checked carefully at least at 1300-1600 and heard nothing – no trace of any signal on 7350. URL is http://www.nohchy.org.ge Address for requests of Nohchy info bulletins is nohchy@wanex.net (Vladimir Titarev, Ukraine, NU)
- CHINA [non] World Falun Dafa Radio changed name to Fang Guang Ming Radio. Address: Fang Guang Ming Inc, P. O. Box 117, Buford, GA 30518, USA. v/s was Yuan Li (Patrick Robich, Austria via Martin Schöch, CRW) Means Great Brightness Radio (Richard Lam, Singapore, Cumbre DX) 12075 & 15440 at 2200. 15440 showed some delay compared to 12075, both running the CIS pips before 2200. 15440 may be from a site in the Far East. I was able to confirm that 12075 is broadcast from old Novosibirsk site (Olle Alm, Sweden, BC-DX) Pips indicate program routed through the Khabarovsk switching centre. The early carrier sign on excludes Komsomolsk, so only Vladivostok and Khabarovsk are left. The weak pips point to Tavrichanka. I guess they are using 100 kW at each location (Novosibirsk + Tavrichanka) (Olle Alm, Sweden, Cumbre DX)
- COLOMBIA Many hams are hearing Radio "Majagual" in AM mode on various freqs very close to 14301 kHz. (The signal drifts around between 14300.8 and 14301.4 kHz, mostly on 14301.1 kHz.) The audio is often distorted, QRMs ham nets on 14300 USB. I notice you had a report (23 Jan 1998) of a Majagual Radio, HJQX, Sincelejo, Colombia, on its third harmonic of 4290.3 (making the fundamental then at 1430.1). If it is the same station, their freq hasn't changed. But tenth harmonic? Wow. Read you every month in MT. Good Show! (Martin H. Potter, VE3OAT, IARU Region 2 Monitoring System Co-ordinator)
- CONGO R. Congo has reactivated 4765, heard from 2130 in French until closing around 2251 (Célio Romais, Brasil) Absolutely amazing signal heard here in UK from 1800 UT onwards (Graham Powell) Huge level 2030-2300\* ex-5985? (Bob Padula, Australia, EDXP) English 1850-1900 (Leigh Morris, South Australia, hardcore-dx) Best here from \*0426 (gh, OK) English language section Sat from around 1835. Announced address not in the WRTH: PO Box 223, Radio Congo, Brazzaville, Republic of Congo (Tom Read, BDXC-UK) Announces daily 15 min English news: Mon-Thu at 1900, Fri at 1930 UT, Sat & Sun at 1835. Their announced address remains P. O. Box 2241, Brazzaville, and they want letters from listeners. Besides national news, they obviously also use items coming from UN Radio, which are then read in the studios of R. Congo (Harald Kuhl, Germany, NU)
- COSTA RICA RFPI welcomes Like It Is, a weekly half-hour public affairs program on issues confronting African-Americans and contemporary American society, politics, education, crime, healthcare, entertainment, host Bob Franklin Thursdays at 1630. RFPI's weekly program previews can be found at http://www.rfpi.org/ update.html (RFPI)
- CROATIA Croatian Radio First Programme, domestic service, SW portion: 6165 0400-2300, 7365 0400-0900, 9830 0430-1800, 13830 0900-2300 (© BBC Monitoring)
- CZECH REPUBLIC Radio Prague has taken the opposite approach of the BBC-WS. On the mailbag, they state they have no thought of leaving shortwave; and to emphasize that, they ask listeners in Australia to tell them a time they would like to see a transmission to that region on shortwave, as many listeners don't have a computer (Bill KA2EMZ Bergadano, swprograms)
- DOMINICAN REPUBLIC Radio Barahona, 4930, Pedernales near the Haitian border, was heard at 2305 relaying VOA's Spanish call-in program, about immigration (José Francisco Ocaña, Barinas, Venezuela, Banda Tropical, Club Diexistas de la
- ECUADOR La Voz del Upano, 5965.00, testing from Tena at 1100, math lessons. At this time LV del Upano, Macas on 5040.07 kHz was off air. The following day Macas and Tena had different programmes. Close down 1337 with "el himno a la provincia del Napo" and started the following day with the Ecuadorian National Anthem (Björn Malm in Quito, Ecuador, SW Bulletin)

It was announced on Inside HCJB that former HCJB staffer, and announcer, Bob Beukema, passed away at the age of 72. That gentleman had an incredible radio voice (Bill Bergadano, Freehold, NJ)

- EQUATORIAL GUINEA 5003.6, Radio Nacional de Guinea Ecuatorial; Bata, reactivated on 5003.6, 2145-2206\*, Non-stop Afro music, closing with national anthem matching the one at http://www.emulateme.com/anthems/ – great signal (Mark Veldhuis, Netherlands, Conexion Digital)
- ETHIOPIA [non] New clandestine from Bulgaria? is Netsanet Radio, testing 12110 at 1700-1800. See http://w/ww.netsanet.com (Ludo Maes, Belgium, Cumbre DX) Not Bulgaria, but via Russia, very good here in Amharic (Ivo and Angel, Observer, Bulgaria) Clearly via CIS (Olle Alm, Sweden, Cumbre DX)
- FINLAND YLE's Latin page is at http://www.yle.fi/fbc/latini/ and the current schedule is at: http://www.yle.fi/fbc/latini/latinsummer.html (Fernandus Sousae Riparius, Portus Cale, Portucale, radioescutas)

Scandinavian Weekend Radio continues the first Saturday of each month for 24 hours from 2100 UT Friday on 11720 or 11690; and also from June testing on 5990 or 6170 (Alpo Heinonen, Rovaniemi, Finland, "A weak voice from the Finnish

- GUATEMALA The "Radio Committee" of the Iglesia Bautista Getsémani has applied for a shortwave license for Radio Amistad at San Pedro La Laguna in Guatemala and I am constructing the transmitter now. The plan is to put it on the air by the end of the year. IF Radio Amistad gets a license it will probably be for the 49 or 60 meter band and most likely 500 watts into a "cloud warmer" (NVIS) antenna of either the dipole/reflector or square loop design. (Larry Baysinger, Cumbre DX)
- GUYANA GBS, 3291.40, has been a regular here with poor to fair signals around 0446 sports; 0514 parallel and just behind BBCWS on 6175 (Walt Salmaniw, Victoria, BC, DX Listening Digest)
- INDIA Please note that there are lot of errors on the official AIR site http:// www.allindiaradio.com which lists the external services. In most cases the timings of latest changes are given in IST rather than UT while the rest of the sked is in UT. Uptodate info on AIR can be got from my site http:// www.bcdx.qrzindia.net (Jose Jacob, India, EDXP)

All India Radio, Jeypore, in the Eastern State of Orissa is noted back on SW after about 2 years. It is of 50 kW and was off air due to shortage of spare valves. Address for reports is: All India Radio, Jeypore 764005, Orissa, India. 5040 0025-0430 (Sundays up to 0445), 1130-1741; 6040 0700-0935 (Sundays also at 1030-1130) (Jose Jacob, VU2JOS, Hyderabad)

INDONESIA New RRI Jakarta networks on SW as follows:

Programa 2 (PRO-2), ex. Prog. Ibukota 2 — sometimes relayed by SW 9680 Programa 3 (PRO-3), ex. Prog. Nasional 1 — news, talks, and entertainment, 9565; 9630; 11760; 11860; 15125 kHz

Programa 4 (PRO-4), ex. Prog. Nasional 1 {sic} — culture (including religions) and sports, 4775

 $Programa\ 5\ (PRO-5),\ ex.\ Prog.\ Nasional\ 2-education\ and\ information,\ 9680;$ 11750; 11885 (Akbar Indra Gunawan, INDONESIA, Jembatan DX)

RRI Palangkaraya, 3325, 1346-1419. Mostly continuous bizarre drumming music. I've heard this before from Palangkaraya so it must be a local thing. This and Pontianak are both heard reliably here with strong signals. Unfortunately I can't get either one to respond to a report! (Ed Tilbury, near Anchorage, Alaska, World of Radio)

- IRAN [non] R. International in Persian via Grigoriopol', Moldova, 500 kW, 115 degrees at 1630-1715 very good on new 11625 plus bubble jammer, ex 11635 (Ivo and Angel, Observer, Bulgaria)
- IRELAND Reflections Europe uses the old Radio Fax transmitters, unlicenced. Usual schedule is 1500-2230 Sunday on 3910 6295 12255. I am not sure what their present QSL policy is; nothing in QSL Information pages since late 1998. Their address is Reflections Europe, Lucks Green, The Forge, Cranleigh, Surrey GU6 7BC, UK. They used to run a loop tape asking for reports to be sent to the individual programmes and also once offered some sort of certificate for replies from 10? of them; as they get paid for airing these programmes, they want the people who pay up to realise that there is an audience out there (Mike Barraclough, England, hard-core-dx)
- ISRAEL Galei Zahal has new frequency change time, heard at 0215-0258\* on 6973 with local pops, folk music, Hebrew talk, fair; then from \*0259-0315+ on 15788.52 with same; had been on 15785.0 a few days earlier (Brian Alexander, PA, DX Listening Digest)
- ITALY RAI seems to have shifted its broadcast in English (and the subsequent broadcast in French) to North America to five minutes later. English newscast now airs [11800, 9675] at 0055 UT with French beginning at 0115. Format of the 20minute broadcast remains unchanged, with 10 minutes of news followed by 10 minutes of fill music (Mike Cooper, GA, June 10, DXLD)

  KURDISTAN [non] Voice of Mesopotamia, 15770, \*1400-1600\* opening in four lan
  - guages, no jamming (Mike Barraclough, UK, DX Listening Digest) Clearly from Samara, Russia with a rather buzzy carrier and strong signal (Olle Alm, Sweden, Cumbre DX) 1400-1455\* in Turkish/Kurdish, \*1500-1601\*v in Kurdish (Ed Kusalik, Alberta, Cumbre DX) BBCM classifies this under clandestine for Turkey: This Kurdish radio station was first observed on 21 May 2001 with tests. IDs as "Denge Mesopotamia" (English: Voice of Mesopotamia). Its broadcasts have been publicised by Medya TV, a Kurdish satellite television station broadcasting from France. During its test transmissions it announced that "Despite all the injustices and oppression, we have not been silenced. Our language has remained the same and songs were composed in this language and on this land and the story of this people was written in it. Let this be your own voice. Look out for us, we are awaiting your requests with great anticipation." No contact details were announced. VOM is believed to broadcast via a high-powered relay, probably in Eastern Europe/CIS. Languages: Kurmanji Kurdish, Sorani Kurdish, Turkish, Zazayee Kurdish. Daily 0800-1000 15230, 1400-1600 15770 (© BBC Monitoring)

Radio Bopeshowa renewed transmissions via a powerful transmitter, 1500-1600 on 9960 on Mon/Wed/Fri (not on Thu now). First half of programme is in Arabic, second in Kurdish, opening with 'Lambada' music (Robertas Petraitis, Lithuania, Clandestine Radio Watch)

# **Shortwave Broadcasting**

- LIBYA Voice of Africa broadcasts 1000-0355 on 17725, also widely heard on MW 711 and 1251. Main language is Arabic, but also news in English and French. English lasts from 2 to 12 minutes, but mostly 7-8. The news in English and French noted after 1100 and then every hour starting from 1700, as monitored: 1140-1150, 1735-1745, 1820-1825, 1920-1925, 2030-2040, 2120-2130, 2220-2225, 2330-2340, 0020-0025, 0130-0140, 0220-0225, 0320-0330. Note: all times variable day to day approx. plus minus 10 minutes! The French news follows right after English. Heard in May 2001 (Robertas Petraitis, Lithuania, World DX Club) Best bet to hear English news is only at 2032-2040, fair and in the clear; Moscow dominating 17725 1730-1800+, poor at 2234-2342 and very weak under strong WYFR (Brian Alexander, PA, DX Listening Digest)
- MOROCCO RTM Rabat back on 7471 and 14942 (2x). Carrier was on before 1800 and programme started at 1802 (Jürgen Lohuis, Germany, harmonics@yahoogroupos.com) 7471.14 and 14942.28, both varying slightly, \\15345 vs Argentina (Vlad Titarev, Ukraine, ibid.)
- NETHERLANDS Director General of Radio Netherlands, Lodewijk Bouwens, has reaffirmed this station's commitment to its shortwave audience in the light of recent developments at the BBC. Mr. Bouwens pointed out that there are 800 million radio sets in the world capable of receiving shortwave broadcasts. He also referred to RN's active involvement in the development of digital shortwave broadcasting (© Radio Netherlands Media Network)
- NIGERIA Voice of Nigeria, 7255 now has English 0500-1000(?) and 1900-2300, also announcing 15120 to America, and 11770 but only 7255 heard as early as 2030. From the programme schedule: Thursday 2230: "World Peace", Saturday 2200: "Who are the Nigerians?", 2230: "African Monarchies", Monday 2230: "African Integration" (Bob Thomas, CT, DXLD) I think announcing ancient and possibly future frequencies is customary (gh)
- PALAU Radio Station T8BZ on Babeldaob Island, Palau, would appreciate reports on our 9985 kHz transmissions from 1100 to 1200 daily. This is the old KHBN which has been allocated a new call sign, running 50 kW to a double extended zepp antenna with reflector curtain, firing into Japan, Korea, China and the Philippines. All reports will be QSLed (Rev Dr Bill Burton, Chief Engineer Radio Station T8BZ, High Adventure Radio Network, PO Box 66, Koror, Palau PW 96940 or Cacciatore@lineone.net (via DXing.com Newsroom)
- PERÚ 2257v, Radio La Mejor, Tumbes, at 1000, splendid strength and audio quality. Hard to believe that it is a harmonic. Announces MW 1130 kHz but not listed in WRTH. New station? Every morning at 1000 "Aires andinos del Perú" and 1030 "Mañanitas pasilleras". Thord Knutsson, responsible for Perú in WRTH, writes that it is not in his lists, could be new or pirate.

2439.65, Radio Bagua, Bagua at 1010. Same DJ also heard previously on Cajaruro, 6524.07. Harmonic  $2 \times 1219.82$ .

2828v, Radio Huarmaca, at 1105. Also heard with ID on unlisted 1414v kHz. Is this Radio Huarmaca a new station? Thord Knutsson says it is the same as on 5385.5.

2840.24, Radio Ilucán, Cutervo, at 1040. Also heard on 1420.12.

2842v (harmonic?) unID "Radio L.Y.R.", la provincia de Sullana (?), el departamento de Piura (?) at 1200. Also with jingle as "Radio Líder"

3179.02, Radio Unión, Tocache, at 0100\*. Announced shortwave 3180 kHz and FM 96.1 MHz. Often music from Tarapoto. Keeps its frequency exactly and has a very regular scheme: 1030-0100. Starts every morning with the programme "El madrugador". Mostly pretty weak signal.

 $434\bar{6}.00\text{v},$  Radio Naylamp, Lambayeque at 2300. Heard both mornings and evenings.

4654.99, Radio Nuevo Amanecer, Celendín at 0050. Reactivated after being off air for a month. Very nice sound quality and great Peruvian folk music.

5264.87, Radio La Voz de Chiriaco, Chiriaco, la provincia de Bagua, el departamento de Amazonas at 0300\*. Announces 5264 kHz. Mostly nonstop Peruvian music interrupted by greetings to friends and acquaintances. Decent signal on air 0000-0300.

5775.29, La Voz de San Juan, provincia de Utcubamba, departamento de Amazonas at 0055. Good and very frequency stable signal; 0200\* one evening, another on much later.

5949.59, Radio Bethel, Arequipa, at 2325. Religious format, heard most evenings but very disturbed by other stations which makes it difficult to ID.

6011.32, Radio L.T.C., Juliaca, provincia de San Román, departamento de Puno at 2305, new on SW? Ads, comunicados and sports from Juliaca. Even ads for companies in Arequipa. Henrik Klemetz says this was previously on 5980.

I have found a very useful site for Peruvian geographical info, http://www.ventanaperu.com/FrmPrincipal.asp?wModo=BG which lists the distritos within each province within each department (Björn Malm, Quito, Ecuador, SW Bulletin, translated by editor Thomas Nilsson for DXLD)

ROMANIA RRI Galbeni, English on 17735 had two strong spurs 306.37 kHz away, on 17428.63 and 18041.37 around 1430 (Wolfgang Bueschel, BC-DX)

RUSSIA 7325, New R. Adygeya, Maykop, Resp. Adygeya, \*1700-1800\*, on the air Mon & Fri in Adegeyan. Also reported to broadcast in Arabic and Turkish, but today all was in Adygeyan! 1700 regional anthem, ID, local classical music, hymn and Balalaika; 1800 a few seconds relay of news from Moscow then abrupt cut off the relay from Krasnodar transmitter! 33443.

17266 USB, Murmansk R. \*0800-0810, New relay, Russian time announcement, ID: "Murmanska Radiyo", temperatures, news, ID; followed 0810-0900\* by relay of Radiostantsiya Atlantika with ID and Russian pop songs (Anker Petersen, Denmark. DXLD)

SIERRA LEONE Radio UNAMSIL is operated by the United Nations Assistance Mission in Sierra Leone. Languages: English, Krio. Address: UNAMSIL HQ., PO Box 5, Freetown, Sierra Leone. Tel: +232 273183/4/5 ext. 6297. Schedule 24h on 6140 and FM 103.0 including UN News in English from NY daily at 0700-0715, 0800-

0815 (© BBC Monitoring) Where are the DX reports of this one?? (gh) I checked 6140 after R Finland 2000\* when the fq was free, but not even a het (Mauno Ritola, Finland, DXLD)

Sierra Leone Broadcasting Service (SLBS). The 100.0 MHz frequency is announced as 99.9. Languages: English, Temme, Mende, Krio, Limba. Address: Sierra Leone Broadcasting Service, New England, Freetown, Sierra Leone. Tel: +232-22-240123/241919/24017. Fax: +232-22-240922. Web Site: http://www.sierra-leone.org/slbs.html Schedule on 3316: 0600-0815, 1700-2000 including 1745-1800 daily, Disarmament, Demobilisation and Reintegration, the RUF Amnesty program (© BBC Monitorina)

- RUF Amnesty program (© BBC Monitoring)

  SINGAPORE 6150, superb reception with ID, "This is Radio Singapore International," iingle. \\ 9600 very good, except for some mild splash at 11:15 (Walt Salmaniw, Grayland WA DXpedition, DXLD)
- SOMALIA 6750-usb, Voice of the People; Radio Mogadishu, 1805 audio a bit muffled, difficult to get solid program details down, not being a linguist, but at least one language I know is music, so I transcribed the distinctive theme tune that was used repeatedly. Hope this counts as proof of reception! (Tom Read, BDXC-UK)
- SWEDEN MediaScan, through its predecessor program, Sweden Calling DXers is the oldest program of its kind in international broadcasting. Under the legendary Arne Skoog, SCDX started as a clearinghouse for news about shortwave radio in 1948. But all good things come to an end, and so it is with this radio program. The last edition will be on July 17th. The good news is that the online and e-mail MediaScan newsletter will continue, covering the entire world of electronic media, with an emphasis on satellites and cyberspace. And it's my plan (subject to approval from management) that as of August 1 the newsletter will revert to a weekly schedule (George Wood, MediaScan 2359 June 20 via Mike Terry, BDXC-UK)
- TAIWAN CBS-R. Taipei International has finally improved their website so it's worth a visit now. The new URL for the English page is http://www.cbs.org.tw/english/index.htm Includes the day's news with archives. Selected programs on real audio include Soundbite and Naluwan (Daniel Sampson, Arcadia WI, June 5, DX Listening Digest)

Prime Time Shortwave http://www.angelfire.com/wi2/shortwave/

TANNU TUVA According to the report of Vladimir Kovalenko, the republic was renamed Tyva. Tyvinskoe Radio (GTRK "Tyva") SW 6100, \\ MW 567: local programs 0610-0700, 1810-1900, 1910-2000 in local and Russian langs. Annt: "Govorit Kyzyl" (Vladimir Kovalenko, Tomsk, Russia, RUS-DX via BC-DX)

UKRAINE RUI will continue using 12040 to North America, Alexandor Yegorov tells me; they were pleased with clear reception and working on the buzzing in the transmitter (Kraig Krist, KG4LAC, VA, DX Listening Digest)

- U K If BBCWS went through with its shortwave cutbacks on July 1, some prime shortwave frequencies at prime listening times could be taken over by some truly awful programming. Perhaps the best replacement programming on those Merlin-owned or brokered transmitters would also come from the U.K. (Kim Elliott, DC, swprograms, standard disclaimer)
- USA WWL, New Orleans, was being heard in the 2322-0042 period on 6484.4, good clean audio, with IDs for 870. This turned out to be a mixing product with WRNO. Mark Morhmann noted that 870 + 6484.4 = 7354.4, a frequency used by WRNO. I then noted The Overcomer exactly on 7353.4 @ 2315, with WWL audible in the background. Only WWL audible on 6484.4 (David Hodgson, TN, DXLD)

Obituary: Christian radio engineer David Briggs, 50, of liver and bone cancer. Briggs was at KCBI \*90.9 Dallas, and built the Criswell shortwave station [now KAIJ] and the FM network "from the ground up." (Bruce F. Elving, FMedia!)

Ranting about lack of support for Mark Koernke, who has been sentenced to a jail term in Michigan, Steve Anderson pulled the plug on his United Patriot Radio June 15. It had been operating day and night on 6900 (Hans Johnson, Cumbre DX; John Norfolk)

UZBEKISTAN R. Tashkent in German at 2000 heard on two third harmonics, 15180 and 15075 (Jürgen Lohuis, Germany, harmonics@yahoogroups.com)

VATICAN/ITALY Vatican Radio and the Italian Government announced an agreement ending the quarrel about the so-called "electro-smog" at Santa Maria di Galeria near Rome. Both parties agreed that SW transmission are complying with Italian regulations. MW adjustments to be completed by August 2001 when Vatican Radio will begin broadcasting also from other European sites, which have been identified and will be announced later. Listeners around Europe will soon find new frequencies (Luigi Cobisi, EDXC via Wolfgang Büschel)

VR broadcasts in Latin for A-01: all but the 1000 broadcast are designated religious [as one would expect].

0530-0600 Daily EuMEAfAsAuAm 0.527 1.530 4.005 5.885-v 7.250 9.645 11.740 15.595 93.3 96.3 105.0

1000-1015 Su. EuAfDom 0.527 1.530 5.885-v 9.645 11.740 15.595 21.850

93.3 105.0

1500-1530 Daily EuDom 1.530 5.885-v 7.250 9.645 93.3

1840-1900 Dailý EuMEAfAsAuAm 0.527 1.260 1.530 4.005 5.885-v 6.185 9.660 11.625 13.765 93.3 96.3 103.8 105.0

(© BBC Monitoring)

VENEZUELA I am hearing Spanish music on 5000 under WWV and YVTO at 0257 (Bob Montgomery, PA, DXLD) At 0115 on 5000 I am hearing R. Popular de Venezuela, YVKG AM 950, mixing with YVTO timesignals (José Elías Díaz Gómez, Venezuela)

VIETNAM [non] V. of Khmer Krom Radio started June 1, Fridays only at 1400-1500 on 15725; see http://www.shortwave.be/cla.html (Ludo Maes, TDP, via Dan Ferguson, SWBC) Mixes with WRMI, had some English phrases such as 'Genocide', 'Cambodia the People & Policing of Vietnam' as well 'fifteen years after the fall' (Ed Kusalik, Alberta, Cumbre DX) Since it was in Cambodian, at first assumed to be clandestine for there but actually for oppressed Cambodians in southern Vietnam (Nick Grace, Clandestine Radio Watch)

Until the Next, Best of DX and 73 de Glenn!

# Global Forum

# **Broadcast Logs**

Gayle Van Horn

gayle@webworkz.com

## 0000 UTC on 4876.7

BOLIVIA: Radio la Cruz del Sur. Program in Aymara and Spanish. Music program to ID as, "Radio La Cruz del Sur, que senal el camino de la vida...". Fair signal quality. (Nicolas Eramo, Argentina) Bolivians audible; Radio Santa Ana 4949, 2203-2209; Radio La Palabra 4732.4; Radio Mallku 4796.4, 2214-2219. (Marcelo Cornachioni & Arnaldo Slaen/DX Camp Punta Indio) Bolivian Survey audible from 2230-2315 - 3392.2 Emisora Camargo; 4471.7 Radio Movima; 4552.3 Radio Difusoras Tropical; 4702.2 Radio Eco; 4716.7 Radio Yura; 4865 Radio Centenario La Nueva; 6024.9 Radio Illimani; 6134.8 Radio Santa Cruz. (Michael Schnitzer, Hassfurt, Germany/Hard-Core DX)

### 0005 UTC on 21680

AUSTRALIA: Radio Australia. Via Darwin in Indonesian, poor to fair signal quality. (Victor Salmaniw, Victoria, BC, Canada/HCDX) Station noted 1125 on 9580 Asia-Pacific program on the newspaper industry in India. (Fraser, MA; David Weronka, Benson, NC) 13605 at 0945, Australia Talks Back, discussion on centralizing the central government. (Bob Fraser, Cohasset, MA)

# 0011 UTC on 6797.5

PERU: Radio Ondas del Rio Mayo. Spanish text to Andean tunes. Station promotional repeated twice, fair to poor signal. Peru's Radio La Voz heard 6250.3, 2250-2305, including regional music and ads. (Claudio Morales, Buenos Aires, Argentina) Peruvian's logged on DX Camp Punta Indio-Radio Ancash 4992.5, 0001-0005; Radio Andina 6673.02, 0110-018 & 0325-0340; Ondas del Huallaga 3329.5, 0015-0025; Radio Huancabamba 6535.37, 0012-0035; Radio Ilucan 5678, 0040-0049; Radio Frecuencia San Ignacio 5699.8, 0045-0050; Radio Superior 5300, 0202-0305; Radio Cora 4915, 0307-0315; Radio Santa Rosa 6045, 1023-1030; Radio Twantinsuyo 6173.4, 1045-1052. (Cornachioni & Slaen)

### 0015 UTC on 6160

CANADA: CKZN St. John's, Newfoundland. News, talk and interviews to weather forecast for Newfoundland and Labrador. Station ID, good signal quality. (Daniele Canonica, Muggio, Switzerland) Radio Canada Int'I monitored 21570 at 2010, Maple Leaf Mailbag (fair-poor). 2010 on 17870 // 15325. (Fraser, MA; Duane Hadley, Bristol, TN) RCI, 0100 on 13670 Canada Today / 13770, 15170, 15305. (William McGuire, Cheverly, MD)

#### 0030 UTC on 9885

SWITZERLAND: Swiss Radio Int'l. Station interval signal, identification, Internet address to Swiss folk melody. (McGuire, MD) National newscast including interview with lady Mt. Everest climber on 13770 at 1937. (Howard Moser, Lincolnshire, IL)

# 0030 UTC on 11970

IRAN: VOIRI. Musical bridge to ID, frequency quote and national anthem, to Qu'ran recitations. (McGuire, MD) 13730 at 2027 including national news to ID, freq quote and 2027\*. (Moser, IL)

# 0055 UTC on 11440

PIRATES: Radio Cochiguaz. South American pirate almost buried under very poor signal quality. *El Condor Pasa* tune to 0100 to "Radio Lord" identification at 0105. **Take It Easy Radio** 6950USB, 0140-0238\*. Feature on AFRS in Vietnam and pop music of that era. Belfast maildrop quote. **Z100**, 6955 USB, 0117-0124+, pop music to ID. Station noted 0052-0054\* including pop music and identifications. **Shadow Radio**, 6950 USB, \*0238-0245+ with ID and *Cartoon Planet* segment. (Frodge, MI)

#### 0132 UTC on 4915

BRAZIL: Radio Anhanguera. Portuguese. Evening program including newscast with promo, "principaes noticia do dia..CBN." Best to monitor in USB. Brazil's **Radio Cultura Filadelfia** noted 2305-2310. Portuguese religious format to Bible verse quotes. ID as, "Cultura Ondas Curtas." (Eramo, ARG) **Radio Clube** 2311 on 3245, ID as "Transamerica" to musical melodies. (DX Camp Punta Indio) **Radio Transmundial** 9530, 0010-0045+. WRTH/

Passport note this as Radio Nova Visao but ID confirmed as "esta Transmundial" at 0043. Commercials and promo identifications to religious spots 0031-0033. (Frodge, MI)

#### 0608 UTC on 21620

FRANCE: Radio France Int'l. Their published English schedule is amiss. I'm hearing 21620 at 0618 in French. Poor level // 17800 stronger. I've not heard them at this time in English. Now at 1455 in English, 11610 at good level, just behind 17720. (Salmaniw, CAN) 17605 at 1635, Club 9516 discusses the Cannes Film Festival, fair signal quality. (Fraser, MA) 0600-0630 should also be on // 11710. -ed.

#### 0645 UTC on 4845

MAURITANIA: RTM . Arabic Quran recitations, SINPO=45554 in upper sideband. (Klaus Elsebusch, Marienthal, Germany) Tentative logging in Arabic, 2105-2135. Very weak for poor audio. (Tom Banks, Dallas, TX)

### 0710 UTC on 9880

CZECH REP: Radio Prague. Simon & Garfunkle classic '60s tunes to station ID. (David Weronka, Benson, NC) Magazine program on religious holidays. 2150 on 11600. (Fraser, MA) Talking Points program on WWII looted art. SIO=3+23. German station interferences to 2255. ID to 2258\*. (Frodge, MI)

### 1030 UTC on 15455

CLANDESTINES: The Voice of the Justice. Listed as broadcasting in Cambodian. Announcer's text and political style commentary format. Abruptly left the air at 1047 sans signoff. Radio Free Iraq 1803-1819 in Arabic on 15160 with announcer duo; International Radio 15550, 1904-1927. Farsi service with Arabic music. Presumed newscast with comments to station identification, 1927\*. (Claudio Morales, Buenos Aires, Argentina)

#### 1150 UTC on 9590

SOUTH KOREA: Radio Korea Int'l. Focus on agriculture of pine trees in South Korea. (Weronka, NC) Station's additional English service monitored as; 0200-0300, 11725 // 11810// 15575; 1300-1400, 9570 (very poor signal quality) // 13670. (Ben A. Clements, Portland, OR)

# 1817 on 11675

RUSSIA: Voice of Russia. Commonwealth Update, focus on new military weapons. (Fraser, MA) 2015 on 15455, national news update on Siberian flood disasters. (Moser, IL) **University Network** via Samara at 1526 on 17645.Dr. Scott programming, lots of splash from 17640 RFA. (Salmaniw, CAN/HCDX)

### 1910 UTC on 11900

BULGARIA: Radio Bulgaria. Events & Developments program featuring meeting of Balkan foreign ministers // 9400. (Fraser, MA) Program segments and news items to ID. Traditional Bulgarian music for Time Out For Music with utility interferences. (Frodge,

# 1907 UTC on 17545

ISRAEL: Kol Israel. News item on continuing demonstrations. (Fraser, MA) Monitored this freq to 1925\*. (Moser, IL)

# 2245 UTC on 7255

NIGERIA: Voice of Nigeria. National, African, and world news to 2256. Reflections program segment including philosophical commentary. UTC time check to ID and schedule at 2300. Monitored in LSB to avoid amateur radio interference to 2301\*. (Frodge, MI) Hausa service audible 0738-0755 for fair signal quality. (Hardley, TN)

#### 2314 UTC on 9570

ROMANIA: Radio Romania Int'l. Station ID to A Challenge For The Future program with focus on future European confederation of countries. Romania in the Third Millenium quiz segment. (Frodge, MI)

Thanks to our contributors – Have you sent in YOUR logs? Send to Gayle Van Horn, c/o Monitoring Times (or e-mail gayle@webworkz.com)

English broadcast unless otherwise noted.

# <u>The QSL Report</u>

Gayle Van Horn

gayle@webworkz.com

# **Lighthouse - Lightship Weekend a Beam for DXers**

Sandy Hook. Fire Island. Boston. St. Augustine and Cape Hatteras. What is it that is so appealing about a lighthouse? Perhaps it is the legends from mariners or tales from the lonely lighthouse keeper. Who hasn't wondered what it might be like to DX atop a lighthouse?

If your wanderlust aims towards lighthouses you're in luck this month. The International Lighthouse-Lightship Weekend (ILLW) will take place from 0001 UTC Saturday August 18 until 2359 UTC on Sunday August 19, 2001.

Hundreds of amateur radio operators worldwide will be broadcasting via ham stations from a lighthouse, lightship or maritime beacon. Participants will operate portable, mobile, marine mobile or maritime mobile from any existing or extinct lighthouse or lightship anywhere in the world. Listeners (a.k.a. "landlubbers") operate from home and work or monitor as many stations as possible.

This is not a contest, but it is designed to promote goodwill and friendship among amateur "ham" operators, as well as shortwave hobbyists. Last year, over 200 amateur radio stations were established at lighthouses or lightships in over 40 countries during this event.

The Amateur Radio Lighthouse Society http://arlhs.com/ (sponsors of the event) recommend the following subbands within the five main ham bands for activity during this weekend event:

### CW (Morse code)

80 meters 3.510-3.540 MHz 40 meters 7.005-7.035 MHz 20 meters 14.010-14.040 MHz 15 meters 21.010-21.040 MHz 10 meters 28.010-28.040 MHz

## Phone (voice)

3.650-3.750 MHz 80 meters 40 meters 7.040-7.100 MHz 14.125-14.275 MHz 20 meters 15 meters 21.150-21.250 MHz 10 meters 28.300-28.400 MHz

QSLing the station involved during this event is open to shortwave listeners as well as "hams." A complete list of entrants and how to OSL them after you have heard or worked them (i.e., a QSL Route) can be found at http://www.vk2ce.com/ illw/2001.htm. When you report these stations you should note



Ponce de Leon Inlet, FL Lighthouse (photo by Gayle VH)

their call, sign, frequency, time, date, and whom they worked, as well as a

Additional information on amateur radio lighthouse operations may be found at the Amateur Radio Lighthouse Society website, www.waterw.com/~weidner/arlhs/index.html. Here you will find links for other events and DX peditions, lighthouse links (some with photos), awards, and a World List of Lights plus more.

If you love the lure of lighthouses, this is an exceptional opportunity to answer that call, recognize the tradition of lighthouses, and pay honor to those who have served as keepers of the light.

### **CANADA**

Voice of Vietnam relay, 9525 kHz. Station verification card unsigned, plus VOV pennant. Received in 78 days for an English report. Station address: 58 Quan Su Street, Hanoi, Vietnam. (Cindy Baumann, Columbia, IL; David Weronka, Benson, NC; Joe Squashic, Wake Forest, NC)

JJY-Standard Time/Frequency Station 8000 kHz. Three special full data fold-over cards, verifying their last days of operation (28, 29, 30 March 2001). Front QSL cover has station information including opening and closing dates ("thanks for joining us for 61 years") plus past QSL images through the years. Cards received for three reception reports with a cassette tape, three US dollars and souvenir postcards. Station address: Communications Research Laboratory, 2-1 Nukui-Kitamachi 4-chome, Koganei-shi, Tokyo 184, Japan. (Lee Silvi, Mentor, OH)

Radio Japan, 6145 kHz. Full data card signed by T. Yaguchi, plus station pennant and schedule. Received in 65 days for an English report and two US dollars. Station address: NHK World, Nippon Hoso Kyokai, Tokyo 150-8001, Japan. (Squashic, NC)

# MEDIUM WAVE

CJVR, 750 kHz AM. Full data letter signed by Bayne Opseth-Chief Engineer. Received in 400 after a follow up AM report. Station address: Box 750, Melfort, SK Canada S0E 1A0. (Patrick Martin, Seaside, OR)

KLZ & KLVZ 560/1220 kHz AM. Verification letter on Crawford Broadcasting Company letterhead, confirming both stations for their format swap. Letter states the KCMN/ 1530, began June 4, parallel broadcasting for some of the programming from KLVZ between 1000 and 1800 Mountain Time. Received in two days for an email report, returned from W.C. "Cris" Alexander-Director of Engineering. Station address: 2150 W. 29th Ave., Suite 450, Denver, CO 80211. (Patrick Griffith, Westminster, CO)

KXO, 1230 kHz AM. Verification letter signed by Carroll Buckley-Vice Pres. Received in 25 days for an AM report. Station address: 420 Main St. (Or) P.O. Box 140, El Centro, CA 92244. (Martin, OR)

WMAQ, 670 kHz AM. Very nice verification letter signed by Donald R. Coleman-WA9DZS, Chief Engineer, plus historical information on the station and souvenir stickers. This was for reception under local KLTT-670 whose tower lights are visible from my receiver site. Received in 20 days for an AM report and one US dollar. Station address: 455 N. Cityfront Plaza, 6th Floor, Chicago, IL 60611. (Griffith, CO)

WTIR, 1680 kHz AM. Winter Garden, FL. Very nice certificate signed by initials R.H.. Received in 215 days for an AM report. QSL

address: 301 Plymouth Dr. NE, Dalton, GA 30721-9987. (Martin, OR)

#### PAPUA NEW GUINEA

NBC, 4890 KHz. Full data color station logo card unsigned. Received in 68 days for an English report, PNG mint stamps, SAE (used for reply) and souvenir postcards. Station address: P.O. Box 1359, Boroko NCD, Papua New Guinea. (Sam Wright, Biloxi, MS)

Radio Southern Highlands, 3275 kHz. Date only verification letter signed by Andrew Meles-Provincial Program Manager. Received in five weeks for a taped report and one U.S. dollar. Station address: P.O. Box 104, Mendi, Southern Highlands Province, Papua New Guinea. (Joe Talbot, CAN/HCDX)

#### **PIRATES**

Radio Neptune, 6950 kHz USB. Full data QSL plus personal letter from veri signer Joe Mack. Received in 109 days for three mint stamps. Pirate QSL maildrop: P.O. Box 109, Blue Ridge Summit, PA 172214. (Ross Comeau, Andover, MA)

Radio Three, 6240 kHz USB. Full data verification sheet signed by Sal. Received in two months for an ACE log. (Comeau, MA) Station only verifies loggings in The ACE (Association of Clandestine Enthusiasts). Sample copies of the The ACE are \$2.00 via P.O. Box 1, Belfast, NY 14711. For loggings, info and more go to website www.frn.net/ace/about.htm.



# **Programming Spotlight**

John Figliozzi ifiglio1@nycap.rr.com

# Discovering Lots of Life on SW (without the BBC)

s I prepare this month's column, it's mid June and the BBC's decision to drop shortwave to North America is still pending. For those who use their radio almost exclusively to DX, the attitude may be, "What's all the fuss? Fewer frequencies occupied by megawatt transmitters? Sounds good

However, for others who use their radio more as a source for information and entertainment or who may have even purchased their radio just to hear the **BBC World Service**, their attitude may be less jaunty. A few may even be contemplating putting that radio up on the shelf and finding something else to do with their newfound free time.

That would be a mistake. Consider this:

(1) One of the great things about shortwave is that it has a penchant for ignoring geographical boundaries (unlike certain BBC bureaucrats). By now, you should have checked the MT Program Guide and discovered that there are quite a few BBC frequencies intended for other areas and carrying other streams that can be heard here quite reliably. If you can overcome your disappointment in the BBC and any feelings of abandonment, the World Service can still be available to you, if you wish.

(2) The BBC World Service is far from the only game in town. If you weren't aware of that fact, maybe it's time you started widening your listening horizons.

Maybe I can help. There isn't enough space here to provide the broadcast times of the more than 50 references mentioned here, but all can all be found in MT's Shortwave Guide this month. As usual, times and days are in UT.

# **News Coverage**

Missing your daily dose of BBC's Newshour or The World Today?

VOA has positioned its News Now service as the international equivalent of a "news whenever you want it" station. Although not intended for an American audience, VOA's shortwave broadcasts can be heard stateside at least several times a day. The early morning (1000-1100) daily and early evening (0000-0200) weekday broadcasts to the Americas are easiest to pick up. If you haven't already done so, experiment a little at other times by trying the frequencies given in our Shortwave Guide. Broadcasts to the Middle East and Africa can regularly be heard in eastern North America; those to East Asia and the Pacific are heard in the west

Deutsche Welle (DW) - for in-depth treat-

ment of European news and issues - and Radio Australia – for comprehensive coverage of the Asia-Pacific region - are two easy-to- hear stations that fill the bill nicely.

**DW** presents *Newslink* every weekday. This excellent program offers full and professional coverage of the whole of the European continent, as well as major international events and issues.

Radio Australia, despite having become a regional broadcaster rather tightly focused on its and neighboring regions, is still well heard in eastern North America at least every morning and in western North America every afternoon and evening usually on frequencies targeted to the Pacific. Asia Pacific, which presents timely and well prepared reports on this volatile and quickly changing region, is broadcast in several editions

Radio New Zealand International (RNZI), also despite not having a specific North American service, can be heard well – especially in summer - even on the east coast. RNZI considers itself primarily a service for the Pacific Island nations, so its reports and news from the region provide another voice to complement Radio Australia's.

Radio Netherlands, through the rather

unique prism of its daily Newsline program, and Radio Exterior de Espana (REE) with its weeknight half hour of news focused on the Iberian peninsula, round out DW's coverage very nicely.

**REE** also puts its focus on "Ibero-America" (Latin America). HCJB's daily newscasts and weekday Studio 9 feature emphasize Central and South America and Radio Habana Cuba provides an added perspective on the re-

Radio Canada International (RCI), despite again undergoing its own internal problems, still does every bit as good a job covering the North American scene as the BBC ever did. As It Happens is the daily domestic CBC program that, over a quarter century ago, originated the now common practice of phoning in to global hotspots and talking with the famous, the infamous and the everyday person about

#### Science and Health

Research File, Radio Netherlands Our World, VOA Quirks and Quarks, RCI Science and Engineering, Voice of Russia The Science Show, The Health Report and Ockham's Razor, Radio Australia Eureka!. RNZI Horizon and Heartbeat, Radio Sweden Spectrum, DW Studio 9 (Tuesday's edition), HCJB

### **Environment**

Man and Environment, DW Earthbeat, Radio Australia Greenscan, Radio Sweden Studio 9 (Thursday's edition), HCJB

### **Documentaries**

Weekly Documentary, Radio Netherlands The Sunday Edition, RCI Background Briefing, Radio Australia

## Literature and Drama

Audio Book Club, Voice of Russia Short Story, Radio Australia Playhouse, RNZI Readings from Czech Literature, Radio Between the Covers, CBC North Quebec American Stories, VOA Special English

what is happening right in front of them. RCI still carries it every weeknight.

The African services of the BBC, VOA and DW, which are designed to serve as "local radio" for the continent, remain the most readily available sources for the region's news. Channel Africa from South Africa and Voice of Nigeria – originating from the continent's two major powers – can often be heard quite well in North America, especially the east coast. Each brings added perspective.

Programs like Dispatches (RCI), Correspondents' Report (Radio Australia) and Worldwatch (RNZI) provide excellent background to current events, as well.

At least philosophically, every station is of some value when it comes to news. Rather than just relying on one source, comparing reports from different sources has always been the best way to try and piece together the truth, whether you have access to the BBC or not.

Below are some examples of quality non-BBC programming in other popular genres. And all this is truly just the tip of the proverbial iceberg! Happy hunting and - still - good listening!

## **Business**

VOA News Now (for daily continuous reports) A Good Life, Radio Netherlands Marks and Markets, DW Money Matters, Radio Sweden

# **Listener Contact**

Talk to America, a daily, global VOA phonein at 1700 Australia Talks Back, Radio Australia Cross Country Check-up. CBC North Quebec In Touch with Stockholm, Radio Sweden Sincerely Yours, Radio Netherland Feedback, Radio Australia Mailbox, RNZI

The Planet, Radio Australia Music 52-15. Radio Netherlands Music Time In Africa, VOA Africa Service Musica del Ecuador, HCJB From Havana and The Jazz Place, Radio Hahana Cuha Global Village, RCI Saturday Music, Radio Prague Music from Flanders, Radio Vlaanderen Internationaal

# How to Use the Shortwave Guide

0000-0100 twhfa USA, Voice of America 5995am 6130ca 7405am 9455af ① ② ⑤ ③ ④ ⑥ ⑦

#### Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Savings) 4, 5, 6, or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each page.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

#### Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. On the top half of the page English broadcasts are listed by UTC time on ①, then alphabetically by country ②, followed by the station name ②. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not daily, the days of broadcast Ä will appear in the column following the time of broadcast, using the following codes:

### Day Codes

Sunday s/S m/M Monday t/T Tuesday w/W Wednesday h/H Thursday f/F Friday a/A Saturday D Daily mon/MON monthly

In the same column **⑤**, <u>irregular broadcasts</u> are indicated "tent" and programming which includes languages besides English are coded "vl" (<u>various languages</u>).

# Choose the most promising frequencies for the time, location and conditions.

The <u>frequencies</u> **6** follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations

and reports from her monitoring team and *MT* readers to make the Shortwave Guide up-to-date as of one week before publication.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the <u>target area</u> ② of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

# Target Areas

af: Africa

al: alternate frequency (occasional use only)

am: The Americas as: Asia

au: Australia

ca: Central America

do: domestic broadcast

eu: Europe

irr: irregular (Costa Rica RFPI)

me: Middle East na: North America om: omnidirectional

pa: Pacific sa: South America

va: various

# Choose a program or station you want to hear.

Selected programs follow immediately after the frequency section and cover prime listening hours – space does not permit 24 hour listings nor can every station be listed. However, listings for the most popular stations and selected lesser-known stations illustrate the variety available on shortwave. The format of the listings alternates among three different styles – by station, by genre and by day – month by month. Times listed are approximate and programs are subject to change.

The program listings emphasize broadcasts targeted to North America. In most cases, the stations and programs listed should be readily receivable in North America using a portable radio. Most broadcasters produce one broadcast in English per day that is repeated over a 24 hour period to all areas. If you are able to listen to transmissions to other areas of the world during "non-prime time" hours, referring to the prime time listings for those stations will likely be helpful in determining what programs will be broadcast.

Occasionally, a program or station listing may be followed by a reference to another listing for the same program or station at a different time. This is done to conserve space and make it possible to provide more listings.

# MT MONITORING TEAM

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# **Program Highlights**

# John Figliozzi

All the recent talk about the **BBC** should not obscure the fact that there are plenty of fine listening opportunities available even without them. A case in point is **Radio Netherlands**.

#### New and Not-So-New from RN

At the end of June, **RN** began a new 17-part series that will run every Friday (UT) through the end of October. The program is titled *Talking It Over*. Presented by Chris Chambers, it features an informal interview with a well-known person who is either Dutch or has lived in The Netherlands for many years.

In addition, you may recall an excellent series that first aired over RN in the mid '90s—*From Saphire to Laser*. (My dictionary says "sapphire," but this is the way it's spelled on the RN web site!) Rob Green returns with a second chance to hear his classical music series, also every Friday.

These program are a quarter-hour each and are aired consecutively. They replace *The Basement Sessions*, the vintage jazz series that has ended its run.

## **RN's Documentaries**

August provides listeners with second chances to hear a quartet of radio documentaries that captured awards and honors at the recent New York Radio Festival:

2nd/4th - Mean or Green: Nuclear Power in Europe, produced by Jonathan Groubert.

9th/11th - Somebody Must be Held Responsible, from Eric Beauchemin.

16th/18th - The Basement Sessions, all that jazz by Hans Mantel.

23rd/25th - Youth Against Aids, from the Roughly Speaking team.

# VOA's Talk to America

Before there was *Talking Point*, there was *Talk to America*. The **VOA**'s global listener phone-in airs "live" Monday through Friday at 1705 on all **VOA News Now** frequencies. Be advised that stateside listeners' calls are not accepted. Nonetheless, the topics are always current and the opinions expressed come from a range of perspectives from around the world. Carol Pearson hosts this daily and lively exchange. The abbreviated version *Best of Talk to America* airs 0233, 1033, 1833 Saturdays; 0633, 1433, 2233 Sundays; and is repeated Fridays at 0033, 0433, 0833, 1233, 2033.

			0000					0100 0100	0127 0127		Czech Rep, Radio Prague Intl Vietnam, Voice of 9525na	5915na	7345na		
0000	0015		Cambodia, National Radio Of	11940as				0100 0100 0100	0130 0130 0130	S	Germany, Universal Life 9435as Hungary, Radio Budapest	9560na 11970am			
0000	0015 0027		Japan, Radio 6145na Czech Rep, Radio Prague Intl	13650pa 7345na	17810pa 11615na			0100	0130 0130	twhfa	Iran, VOIRI 9022am 9835am Slovakia, R Slovakia International USA, Voice of America 5995am	5930na 6130am	7230ca 7405am	9440sa 9455am	9775am
0000	0030		Australia, Radio 9660pa 17580pa 17775as 17795va	12080pa 21740va	15415as	15240as	15415as	0100	0130	IWIIIG	13740am Uzbekistan, Radio Tashkent	7190as	9375as	9530as	9715as
0000	0030 0030		Egypt, Radio Cairo 9900am Thailand, Radio 9655af	9690af	11905af			0100 0100	0145 0156		Germany, Deutsche Welle North Korea, Voice of Korea	6040na 3560va	9640am 11734va	11810na 15230va	13720am 17735va
0000	0030		UK, BBC World Service 3915as 9410me 9590am 9915sa	5965as 11945as	5975am 11955as	6195as 12095sa	7105as 15280as	0100	0159		Canada, R Canada International 15170am	5960am	9755am		13770am
0000	0045		15310as 15360as 17615as India, All India Radio 9705as	17790as 9950as	11620as	13605as	107/0	0100 0100	0200 0200	vļ	Anguilla, Caribbean Beacon Australia, ABC/Katherine	6090am 5025do			
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0000	0100	vl	Canada, R Canada International Anguilla, Caribbean Beacon Australia, ABC/Alice Springs	6090am 4835do				0100	0200		Australia, Radio 9660pa 17750as 17755as 17795va	12080pa 21725pa	15240as	15415as	17580pa
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0000	0100 0100		Australia, Christian Voice Canada, CBC Northern Service	17775pa 9625do	17850va	21550va	21680pa	0100 0100	0200 0200		Canada, CHNX Halifax, NS Canada, CKZN St John's NF	6130do 6160do			
0000	0100 0100		Canada, CFRX Toronto ON Canada, CFVP Calgary AB	6070do 6030do				0100 0100	0200 0200		Canada, CKZU Vancouver BC China, China Radio International	6160do			
0000	0100 0100		Canada, CHNX Halifax, NS Canada, CKZN St John's NF	6130do 6160do				0100 0100	0200 0200		Costa Rica, R for Peace Intl Costa Rica, University Network	7455irr 5030am	15049va 6150am	21815va 7375am	9724sa
0000	0100		Canada, CKZU Vancouver BC Costa Rica, R for Peace Intl	6160do 7455irr	15049va		0704	0100	0200		11870am 13749na Cuba, Radio Havana 6000na	9820na	11705na		
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0000	0100 0100 0100	a/monthly	Ecuador, HCJB 9745na Finland, Scandv Weekend Radio Guyana, Voice of 3289do	11720va 5949do	21433080			0100 0100 0100	0200 0200 0200		Guyana, Voice of 3289do Indonesia, Voice of 9525as	5949do 11784as	15149as	15205	17/05
0000	0100 0100		Japan, Radio 6145na Malaysia, Radio 7295do	371740				0100	0200		Japan, Radio 11860pa 17810as 17835sa 17845as Malaysia, Radio 7295do	1107Ume	11880me	1332308	17003pa
0000	0100 0100		Malaysia, RTM Kota Kinabalu Malaysia, RTM Sarawak 7160do	5980do				0100 0100	0200 0200		Malaysia, RTM Kota Kinabalu Namibia, Namibian BC Corp	5980do 3270af	3289af		
0000	0100	vl	Namibia, Namibian BC Corp Netherlands, Radio 6165na	3270af 9845na	3289af			0100 0100	0200 0200		New Zealand, R New Zealand Int New Zealand, ZLXA 3935do	17675pa 7290do			
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0000	0100 0100	vl/a	Solomon Islands, SIBC 9545do Spain, R Exterior Espana 15385na					0100 0100	0200 0200	VI/ U	Spain, R Exterior Espana 15385na Switzerland, Swiss R International	9885am			
0000	0100 0100		Ukraine, R Ukraine International USA, Armed Forces Radio	5905eu 4278va	7320as 4319va	9640as 4993va	12040na 5765va	0100	0200		UK, BBC World Service 5965as 9915sa 11955as 12095sa	5975am 15280as	6195as 15310as	9410as 15360as	9590am 17790as
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0000	0100		USA, WHRA Greenbush ME USA, WHRI Noblesville IN	7580eu 5745va	7315am			0100 0100	0200 0200		USA, WBCQ Monticello ME USA, WBCQ Monticello ME	7415na 7415na	9330na 9330na		
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0000	0100 0100		USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC	7355va 7535am	9430am	15285sa		0100 0100	0200 0200 0200		USA, WINB Red Lion PA 12160am USA, WJCR Upton KY 7490am		7313dill		
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0000	0100		USA, WWCR Nashville TN USA, WWFV McCaysville GA	5070na 5085va	7435na 6890am	9475na	13845na	0100 0100	0200 0200		USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC	7355va 7535na	9430am	15285sa	
0000 0000 0000	0100 0100 0100	vl	USA, WYFR Okeechobee FL Vanuatu, Radio 3945do Zambia, Christian Voice 4965do	6085na 4960do	9505na 7260do			0100	0200		USA, WTJC Newport NC 9370na USA, WWCR Nashville TN USA, WWFV McCaysville GA	3215na	5070na	7435na	13845na
0030	0100		Australia, Radio 9660pa 17750as 17755as 17795va	12080va 21740va	15240pa	15415as	17580pa	0100 0100 0100	0200 0200 0200	vl	USA, WWFV McCaysville GA USA, WYFR Okeechobee FL Vanuatu, Radio 3945do	5085va 6065na 4960do	9505na 7260do	15060as	
0030 0030	0100 0100		Iran, VOIRI 9022am 9835am Lithuania, Radio Vilnius 11690eu	11970am				0100 0130	0200 0145	vl	Zambia, Christian Voice 4965do Libya, Voice of Africa 11815af	15435af	17725af		
0030 0030	0100 0100		Sri Lanka, Sri Lanka BC Corp Sri Lanka, Sri Lanka BC Corp	4940do 4940do	6005as	6075as	9770as	0130 0130	0200 0200		Austria, R Austria International Sweden, Radio 13625as	9870na			
0030 0030	0100 0100		15425as Thailand, Radio 9655as UK, BBC World Service 5965as	11905as 5975am	15395na 6195as	7105as	9410me	0130	0200	twhfa twhfa	UK, RTE Radio 6155ca USA, VOA Special English USA, Voice of America 5995am	9775am	7405am	13740am	
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0200 0200	0256 0256		North Korea, Voice of Korea Romania, R Romania International		13650va 15105as	15180as	15340na	0300	0400 0400	vl vl	Australia, ABC/Alice Springs Australia, ABC/Katherine	4835do 5025do			
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0200	0300		17580va 17750as 21725va Bulgaria, Radio 9400na	11700na				0300	0400		Canada, CHNX Halifax, NS Canada, CKZN St John's NF	6130do 6160do			
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0200 0200	0300 0300		Cuba, Radio Havana 6000na Ecuador, HCJB 9745na	9820na 15115na	11705na 21455usb			0300 0300	0400 0400	vĺ ′	Guatemala, Radio Cultural Guyana, Voice of 3289do	3300do 5949do	5955do		
0200 0200	0300 0300	a/monthly	Egypt, Radio Cairo 9475am Finland, Scandv Weekend Radio	11720va				0300 0300	0400 0400	sm	Honduras, Radio Luz y Vida Japan, Radio 17825ca	3250ca 21610pa			
0200 0200	0300		Guyana, Voice of 3289do Kenya, Kenya BC Corp 4885irr	5949do 4915irr				0300	0400	vl	Kenya, Kenya BC Corp 4885irr Lesotho, Radio 4800do	4915irr			
0200 0200 0200	0300 0300 0300		Malaysia, Radio 7295do Malaysia, RTM Kota Kinabalu Namibia, Namibian BC Corp	5980do	2000.1			0300	0400		Malaysia, Radio 7295do Malaysia, Voice of Islam	6175as	9750as	15295as	
0200 0200 0200	0300		New Zealand, R New Zealand Int New Zealand, ZLXA 3935do	3270af 17675pa 7290do	3289af			0300 0300 0300	0400 0400 0400		Namibia, Namibian BC Corp New Zealand, R New Zealand Int Oman, Radio Sultanate of	3270af 17675pa 15355va	3289af		
0200 0200	0300	νl	Papua New Guinea, NBC Russia, Voice of Russia WS	9675do 9665na	11880irr 12000na	17595na		0300	0400 0400	vl	Papua New Guinea, NBC Philippines, Radyo Pilipinas	9675do 11885	11880irr	15120pa	15270pg
0200 0200	0300 0300	vl/as	Singapore, SBC Radio One Solomon Islands, SIBC 5020do	6150do				0300	0400		Russia, Voice of Russia WS 17650na 17660na 17690na	9665na	11750na	12000na	
0200 0200	0300 0300	vl/a	Solomon Islands, SIBC 9545do South Korea, R Korea Intl	7275na	11725sa	11810sa	15575na	0300 0300	0400 0400	vl/as	Singapore, SBC Radio One Solomon Islands, SIBC 5020do	6150do			
0200	0300		Sri Lanka, Sri Lanka BC Corp 15425as	6005as	6075as	6130do	9770as	0300	0400 0400	vl/a	Solomon Islands, SIBC 9545do Sri Lanka, Sri Lanka BC Corp	6005as	6075as	6130do	9770as
0200	0300		Taiwan, Radio Taipei International 15345as UK, BBC World Service 5975am	6135am	9680na 6195as	11740am 9410as	9770af	0300 0300	0400 0400		15425as Taiwan, Radio Taipei International Turkey, Voice of 7270af	5950na 11655va	9680na 21715as	11875pa	15320as
0200	0300		9915sa 11955as 12095va UK, Merlin Network One 9430na	15280as			17790as	0300	0400 0400		Uganda, Radio 4976do Ukraine, R Ukraine International	5026do 7320as	7410eu	9640as	12040as
0200	0300		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va	0300	0400		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va
0200	0300		13254va 13362va 16847va USA, KAIJ Dallas TX 5755va					0300	0400		13254va 13362va 16847va USA, KAIJ Dallas TX 5755va				
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0200 0200	0300 0300		USA, WEWN Birmingham AL USA, WHRA Greenbush ME	5825na 7580eu				0300 0300	0400 0400	S	USA, WINB, Red Lion PA 12160am USA, WJCR Upton KY 7490am	13595as	70100		
0200 0200	0300 0300		USA, WHRI Noblesville IN USA, WJCR Upton KY 7490am	5745va 13595as	7315am			0300 0300	0400 0400		USA, WMLK Bethel PA 9465eu USA, WRMI Miami FL 7385na				
0200 0200	0300		USA, WRMI Miami FL 7385na USA, WRNO New Orleans LA	7355va				0300	0400 0400		USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC	7395am 5850na	11550eu		
0200 0200	0300		USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na	5850na		9430na	7.125	0300	0400		USA, WTJC Newport NC 9370na USA, WWCR Nashville TN	3215na	5070na	5935na	7435na
0200 0200 0200	0300 0300 0300		USA, WWCR Nashville TN USA, WWFV McCaysville GA USA, WYFR Okeechobee FL	3215na 5085va 6065na	5070na 9505na	5935na	7435na	0300 0300 0300	0400 0400 0400	vl	USA, WWFV McCaysville GA USA, WYFR Okeechobee FL Vanuatu, Radio 3945do	5085va 6065na 4960do	9505na 7260do		
0200 0200	0300	νl	Vanuatu, Radio 3945do Zambia, Christian Voice 4965do	4960do	7260do			0300	0400 0400	vl	Zambia, Christian Voice 6065do Zambia, National BC Corp	6165do	6265do		
0200 0215	1215 0220		Cambodia, National Radio Of Nepal, Radio 5005as 7165as	11940as				0300 0310	0400 0315	vl	Zimbabwe, Zimbabwe BC Corp Vatican City, Vatican Radio	4828do 7305am	6045do	9660af	
0230 0230	0257 0300		Vietnam, Voice of 9525na Albania, R Tirana International	6115na	7160na			0315 0325	0340 0358		Vatican City, Vatican Radio Honduras, Radio Litoral 4832irr	9660af			
0230 0230	0300		Hungary, Radio Budapest Philippines, Radyo Pilipinas		15120pa	15270pa		0330	0345	vl	Libya, Voice of Africa 11815af Czech Rep, Radio Prague Intl	15435af 11600as	17725af 15470as		
0230 0230 0230	0300 0300 0300		Slovakia, Adventist World Radio Sweden, Radio 9495am Switzerland, Swiss R International	7235as 9755na 9885am				0330 0330 0330	0357 0400 0400		Vietnam, Voice of 9795na Austria, AWR Europe 17635as Myanmar, Radio 9730do				
0240	0247		Croatia, The Voice of Croatia	6165eu	7365eu	9830eu	9925sa	0330	0400 0400 0400		Myanmar, Radio 9730do Sweden, Radio 11895na UAE, Radio Dubai 11725na	12005na	13675na	15395na	
0250 0250	0300 0300	vl	Vatican City, Vatican Radio Zambia, National BC Corp	7305am 6165do	9605am 6265do				0400		UK, BBC World Service 3255af 6195eu 7120af 7160af	5975am 9410eu	6005af 11730af	6135am	6190af 12095me
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			0300					0330 0345	0400 0400	twhfa f	USA, WBCQ Monticello ME Seychelles, FEBA Radio 11885af	9330na			
0300	0327		Vatican City, Vatican Radio Czech Rep, Radio Prague Intl	7305am 7345na	9605am 7385na	9870na					0400				
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	0330		UK, BBC World Service 3255af 6195eu 7120af 7160af	5975am 9410eu	6005af 11730af	6135am 12035as	6190af 12095me	0400 0400 0400	0405 0405	sm twhfa	USA, WWCR Nashville TN USA, WWCR Nashville TN	3210na 3215na	3,331lu	55110	
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0300	0330	s twhfa	USA, WBCQ Monticello ME USA, WBCQ Monticello ME	7415na 9330na	0/:0	10705	15165	0400	0430	as	17580pa 21725pa Australia, Radio 17750as		•		
0300 0300	0345		Germany, Deutsche Welle Anguilla, Caribbean Beacon	9535na 6090am	9640na	13780am	15105na	0400 0400	0430 0430		Belgium, RVI Flanders R Intl France R France International	15595na 9550af	15155af		
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0400 0400	0430 0430 0430 0430	s twhfa vl	Mexico, R Mexico International Nigeria, Radio/Kaduna 6090do S Africa, Channel Africa 5955af Sri Lanka, Sri Lanka BC Corp	9705am 7275do 6005as	11770am 6075as	6130do	9770as	0500 0500 0500 0500	0530 0530 0530 0530	s twhfa	Mexico, R Mexico International Netherlands, Radio 6165na S Africa, Adv World Radio Africa S Africa, Channel Africa 11720af	9705am 9845na 5960af	11770am 6015af		
0400	0430 0430 0430		15425as Switzerland, Swiss R International	9610eu 7415na	9885am	013000	7770ds	0500 0500 0500	0530 0530 0530 0530		Switzerland, Swiss R International Uganda, Radio 4976do USA, WRMi Miami FL 7385na	9610eu 5026do			
0400 0400	0430 0430	h	USA, WBCQ Monticello ME USA, WBCQ Monticello ME USA, WRMI Miami FL 7385na	9330na 7225af	0646-4	0745-4	13690af	0500 0500	0530 0530 0545 0600	s twhfa vl	Zimbabwe, Zimbabwe BC Corp Germany, Deutsche Welle	4828do 9690na 6090am	6045do 9785na	11985na	
0400 0400	0445 0455 0456		Germany, Deutsche Welle USA, WYFR Okeechobee FL China China Radio International	6065na 9560na	9565af 9355eu 9730na	9765af 9505na		0500 0500 0500	0600 0600	vl vl	Anguilla, Caribbean Beacon Australia, ABC/Alice Springs Australia, ABC/Katherine	4835do 5025do			
0400 0400	0456 0500 0500	vl	Romania, R Romania International Anguilla, Caribbean Beacon Australia, ABC/Alice Springs	6090am 4835do	15365na	17735as	2148Uas	0500 0500 0500	0600 0600 0600	vl vl	Australia, ABC/Tennant Creek Australia, Christian Voice Botswana, Radio 3356do Canada, CFRX Toronto ON	4910do 21550va 4820do	21680pa 7255do		
0400 0400	0500 0500 0500 0500	vl vl	Australia, ABC/Katherine Australia, ABC/Tennant Creek Australia, Christian Voice	5025do 4910do 21550va	21680pa 7255do			0500 0500 0500 0500	0600 0600 0600 0600		Canada, CFVP Calgary AB Canada, CHNX Halifax, NS	6070do 6030do 6130do			
0400 0400	0500 0500 0500	VI	Botswana, Radio 3356do Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB	4820do 9625do 6070do 6030do	723300			0500 0500 0500	0600 0600 0600		Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, R for Peace Intl Costa Rica, University Network	6160do 6160do 7455irr 5030am	15049va 6150am	7375am	9724sa
0400 0400	0500 0500 0500		Canada, CHNX Halifax, NS Canada, CKZN St John's NF Canada, CKZU Vancouver BC	6130do 6160do 6160do				0500 0500	0600 0600		11870am 13749na 17645as Cuba, Radio Havana 9550na Ecuador, HCJB 9745na	9820na 15115na	9830na 21455usb	7073diii	// Z-130
0400	0500 0500		Costa Rica, R for Peace Intl Costa Rica, University Network 11870am 13749na 17645as	7455irr 5030am	15049va 6150am	7375am	9724sa	0500 0500 0500	0600 0600 0600	a/monthly	Finland, Scandv Weekend Radio Guyana, Voice of 3289do Italy, Italian Radio Relay Service	11720va 5949do 3985va	21100030		
0400	0500 0500 0500	a/monthly	Cuba, Radio Havana 6000na Ecuador, HCJB 9745na Finland, Scandv Weekend Radio	9820na 15115na 11720va	11705na 21455usb			0500	0600		Japan, Radio 5975eu 13630na 15195as 17810pa Kenya, Kenya BC Corp 4885irr	6110na 21755pa 4915irr	7230eu	11715as	11760as
0400 0400	0500 0500 0500	vl	Guatemala, Radio Cultural Guyana, Voice of 3289do Kenya, Kenya BC Corp 4885irr	3300do 5949do 4915irr	5955do			0500 0500 0500	0600 0600 0600	vl vl	Kuwait, Radio 15110as Lesotho, Radio 4800do Liberia, R Liberia International	5100do			
0400 0400	0500 0500 0500	vl	Lesotho, Radio 4800do Malaysia, Radio 7295do Malaysia, Voice of Islam	6175as	9750as	15295as		0500 0500 0500	0600 0600 0600		Malaysia, Radio 7295do Malaysia, RTM Sarawak 7160do Malaysia, Voice of 6175va	9750va	15295va	15005	
0400 0400	0500 0500 0500 0500		Myanmar, Radio 9730do Namibia, Namibian BC Corp New Zealand, R New Zealand Int New Zealand, ZLXA 3935do	3270af 17675pa 7290do	3289af			0500 0500 0500 0500	0600 0600 0600 0600		Malaysia, Voice of Islam Myanmar, Radio 9730do Namibia, Namibian BC Corp New Zealand, R New Zealand Int	6175as 3270af 11725pa	9750as 3289af	15295as	
0400 0400	0500 0500 0500	vl vl	Nigeria, Radio/Enugu 6025do Papua New Guinea, NBC Russia, Voice of Russia WS	9675do 9665na	11880irr 11750na	12000na	17565ng	0500 0500 0500	0600 0600 0600	vl vl	New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do Nigeria, Radio/Ibadan 6050do	7290do			
0400	0500 0500	vl/as	17650na 17660na 17690na Singapore, SBC Radio One Solomon Islands, SIBC 5020do	6150do				0500 0500 0500	0600 0600 0600	vl vl	Nigeria, Radio/Kaduna 4770do Nigeria, Radio/Lagos 3326do Nigeria, Voice of 7255af	6090do 4990do 11770af	7275do 15120na	9570do	
0400	0500 0500 0500	vl/a	Solomon Islands, SIBC 9545do Uganda, Radio 4976do UK, BBC World Service 3255af	5026do 5975am	6005af	6135am	6175am	0500 0500 0500	0600 0600 0600	vl	Papua New Guinea, NBC Russia, Voice of Russia WS Singapore, SBC Radio One	9675do 17635au 6150do	11880irr 17685au	21790au	
0400	0500		6190af 6195eu 7120af 15280as 15310as 15420af 21660as 21830as USA, Armed Forces Radio	7160af 15575me 4278va	9410eu 17640af 4319va	12035eu 17760as 4993va	12095me 17790as	0500 0500 0500 0500	0600 0600 0600 0600	vl	Solomon Islands, SIBC 5020do Spain, R Exterior Espana 6055na Sri Lanka, Sri Lanka BC Corp Swaziland, Trans World Radio	9545do 6130do	6035af	9500af	
	0500		6350va 6458va 6847va 13254va 13362va 16847va USA, KAIJ Dallas TX 5755va	10320va	10940va	12579va	5765va 12689va	0500	0600		UK, BBC World Service 5975am 7160af 9410eu 9740as 15280as 15310as 15360as	4775af 6005af 11760me 15420af	6175am	6190af 11940af 17640af	6195eu 12095eu 17760as
0400	0500 0500 0500		USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI 17780as USA, Voice of America 4960af	7510na 5855af	6080af	7275af	7290af	0500	0600		17790as 17885af 21660as USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va
0400	0500 0500 0500		9530va 9575af 11965me USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN	15205va 5825na 7580eu 5745va	17895af 7315am			0500 0500 0500	0600 0600 0600		13254va 13362va 16847va USA, KAIJ Dallas TX 5755va USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI 11565pa	7510na 17780as			
0400 0400	0500 0500 0500		USA, WJCR Upton KY 7490am USA, WMLK Bethel PA 9465eu USA, WSHB Cypress Crk SC	13595as 11930eu				0500	0600		USA, Voice of America 5970af 11965me 12080af 13670af USA, WBCQ Monticello ME	6035af 15205va 7415na	6080af	7195af	9530va
0400 0400	0500 0500 0500		USA, WTJC Newport NC 9370na USA, WWFV McCaysville GA Zambia, Christian Voice 6065do	5085va				0500 0500 0500	0600 0600 0600		USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN	5825na 11730af 5745va	7315am		
0400 0405	0500 0500 0500	vl vl	Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp USA, WWCR Nashville TN	6165do 4828do 3210na	6265do 6045do 5070na	5935na	7435na	0500 0500 0500	0600 0600 0600		USA, WJCR Upton KY 7490am USA, WMLK Bethel PA 9465eu USA, WRNO New Orleans LA	13595as 7395am	11000		
0430	0525 0500 0500	а	Liberia, Voice of Hope 12060af Australia, Radio 9660pa 17580pa 21725pa Italy, Italian Radio Relay Service	15320af 12080pa 3985va	15240as	15415as	15515va	0500 0500 0500 0500	0600 0600 0600 0600		USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na USA, WWCR Nashville TN USA, WYFR Okeechobee FL	9840af 3210na 5985na	11930eu 5070na 9355eu	5935na 11580eu	7460na
0430 0430	0500 0500 0500 0500	vl vl	Netherlands, Radio 6165na Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	9590na 6090do	7275do	9570do		0500 0500 0500	0600 0600 0600	vl vl	Vanuatu, Radio 3945do Zambia, Christian Voice 6065do Zambia, National BC Corp	4960do 6165do	7260do 6265do	. 100060	
0430 0430 0430	0500 0500 0500	vl	Nigeria, Radio/Lagos 3326do S Africa, Adv World Radio Africa Sri Lanka, Sri Lanka BC Corp	4990do 11975af 6130do				0515 0520 0525	0530 0530 0600	h a vl	USA, KVOH Los Angeles CA Vatican City, Vatican Radio Ghana, Ghana BC Corp	9975na 9660af 3366do	11625af 4915do	15570af	
0430 0430	0500 0500 0500 0500	mtwhfa s twhfa	Swaziland, Trans World Radio Switzerland, Swiss R International USA, WBCQ Monticello ME USA, WRMI Miami FL 7385na	3200af 9885am 7415na	4775af			0530 0530 0530	0540 0545 0600	vl ma	Cameroon, CRTV Radio Buea USA, KVOH Los Angeles CA Australia, Radio 9660pa 17750as 21725pa	6005do 9975na 12080va	15240pa	15515va	17580pa
0430	0500 0500	3 IWIIIU	Yugoslavia, Radio 11870na Italy, RAI International 5975af USA, WYFR Okeechobee FL	7235af 9355eu				0530 0530 0530	0600 0600 0600		Georgia, Georgian Radio S Africa, Adv World Radio Africa Thailand, Radio 9655eu	11805eu 11970af 11905eu	21795eu		
			0500					0530 0530 0530	0600 0600 0600	smtwhf vl	UAE, Radio Dubai 13675au UK, BBC World Service 17885af Zimbabwe, Zimbabwe BC Corp	15435au 5975do	17830au 6045do	21700au	
	0515 0515	s hfa	Canada, CBC Northern Service USA, KVOH Los Angeles CA	9625do 9975na				0532 0545	0600 0600	ma	Austria, R Austria International USA, KVOH Los Angeles CA	6155eu 9975na	13730eu		
0500 0500	0520 0530	as	Vatican City, Vatican Radio 11625af 15570af Australia, Radio 17750as	4005eu	5885eu	7250eu	9660af				0600				
	0530		France R France International	11710af	17800af			0600	0615		S Africa, Trans World Radio	11640af			

0600 0600 0600	0615 0630 0630	mtwhfa mtwhfa	USA, WBCQ Monticello ME France R France International Malta, Voice of Mediterranean	7415na 11710af 6110eu	17800af	21620as					0700				
0600 0600	0630 0630		S Africa, Channel Africa 15215af USA, Voice of America 5970af 9680af 11805af 11965me	6035af 11995af	6080af 12080af	7195af 13670af	9530va 15205va	0700 0700	0720 0727		Swaziland, Trans World Radio Czech Rep., Radio Prague Intl	4775af 9880eu	6035af 11600eu	9500af	
0600 0600 0600 0600 0600 0600	0641 0645 0700 0700 0700 0700 0700	vl vl vl	Romania, R Romania International Germany, Deutsche Welle Anguilla, Caribbean Beacon Australia, ABC/Alice Springs Australia, ABC/Kotherine Australia, ABC/Tennant Creek Australia, Christian Voice	11925af 6090am 4835do 5025do 4910do 21550va	15180na 13640af 21680pa	13790af	17860af	0700 0700 0700 0700 0700	0730 0730 0730 0730 0730	vl as	Belgium, RVI Flanders R Intl Papua New Guinea, NBC Slovakia, R Slovakia International UK, BBC World Service 6190af 11940af 12095eu 15310as 15575as 17640eu 17760as UK, BBC World Service 17885af USA, Voice of America 6873va	9865eu 9675do 9440au 9410eu 15360as 17790as	11880irr 15460au 9740as 15400af 17830af	17550au 11760me 15485eu 21660as	11765af 15565eu
0600 0600 0600 0600 0600 0600 0600	0700 0700 0700 0700 0700 0700 0700 070	vl	Australia, Radio 9660pa 17580pa 17750as 21725pa Botswana, Radio 7255do Canada, CFRX Toronto ON Canada, CFRY Calgary AB Canada, CHNX Halifax, NS Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, R for Peace Intl	7255do 6070do 6030do 6130do 6160do 6160do 7455irr	15240pa 9600do 15049va		15515va	0700 0700 0700 0700 0700 0700 0700 070	0756 0800 0800 0800 0800 0800 0800	vl vl vl	Son, Volce Vinienta Volta Romania, R Romania, R Romania Internationa Anguilla, Caribbean Beacon Australia, ABC/Rice Springs Australia, ABC/Katherine Australia, ABC/Katherine Australia, Christian Voice Australia, Radio 9660pa 17750pa 21725pa Botswana, Radio 7255do	6090am 4835do 5025do 4910do	21680pa 15240va 9600do	15415as	17580ра
0600 0600 0600 0600 0600	0700 0700 0700 0700 0700 0700	a/monthly	Costa Rica, University Network 11870am 13749na 17645as Cuba, Radio Havana 9550na Ecuador, HCJB 9745na Finland, Scandv Weekend Radio Germany, Overcomer Ministries Ghana, Ghana BC Corp	9820na 11680eu 11690va 9430pa 3366do	9830na 15115na 13810au 4915do	7375am 21455usb		0700 0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800	VI	Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CHNX Halifax, NS Canada, CKZV St John's NF Canada, CKZV Vancouver BC Costa Rica, R for Peace Intl Costa Rica, University Network	6070do 6030do 6130do 6160do 6160do 7455irr 5030am	15049va 6150am	7375am	9724sa
0600 0600 0600 0600	0700 0700 0700 0700 0700	mtwhf/vl	Guyana, Voice of 3289do Italy, Italian Radio Relay Service Japan, Radio 7230eu 21755pa Kenya, Kenya BC Corp 4885irr Kuwait, Radio 15110as	5949do 7120va 11740pa 4915irr	13630pa	15195as	17870pa	0700 0700 0700 0700	0800 0800 0800 0800	mtwhf as/vl a/monthly	11870am 13749na 17645as Ecuador, HCJB 11680eu Eqt Guinea, Radio Africa Eqt. Guinea, Radio East Africa Finland, Scandv Weekend Radio	11755pa 15185af 15185af 11690va	21455usb	73734111	77 Z 45U
0600 0600 0600 0600 0600	0700 0700 0700 0700 0700 0700	vl vl vl	Lesotho, Radio 4800do Liberia, ELWA 4760do Liberia, R Liberia International Malaysia, Radio 7295do Malaysia, RTM Sarawak 7160do Malaysia, Voice of 6175va	5100do 9750va	15295va			0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800	as vl	France R France International Germany, Deutsche Welle Germany, Overcomer Ministries Germany, Trans World Radio Germany, Voice of Hope 5975eu Ghana, Ghana BC Corp	15605af 13640eu 9430pa 12070eu 21590me 3366do	13810au 4915do		
0600 0600 0600 0600	0700 0700 0700 0700 0700	vļ	Myanmar, Radio 9730do Namibia, Namibian BC Corp New Zealand, R New Zealand Int New Zealand, ZLXA 3933do Nigeria, Radio/Enugu 6025do	3270af 11725pa 7290do	3289af			0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800	as/vl vl vl	Guyana, Voice of 3289do Italy, Italian Radio Relay Service Kenya, Kenya BC Corp 4885irr Kuwait, Radio 15110as Lesotho, Radio 4800do Liberia, ELWA 4760do	5949do 7120va 4915irr			
0600 0600 0600 0600 0600	0700 0700 0700 0700 0700 0700	vl vl vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do Nigeria, Radio/Lagos 3326do Nigeria, Voice of 7255af Papua New Guinea, NBC Russia, Voice of Russia WS	6090do 4990do 11770af 9675do 15490au	7275do 15120na 11880irr 17635au	9570do 17685au	21790au	0700 0700 0700 0700 0700	0800 0800 0800 0800 0800	vI	Liberia, R Liberia International Malaysia, Radio 7295do Malaysia, RTM Sarawak 7160do Malaysia, Voice of 6275as Monaco, Trans World Radio	5100do 9750as 9870eu	15295as		
0600 0600 0600 0600 0600	0700 0700 0700 0700 0700 0700	vl	Sierra Leone, Sierra Leone BS Singapore, SBC Radio One Solomon Islands, SIBC 5020do Sri Lanka, Sri Lanka BC Corp Swaziland, Trans World Radio Uganda, Radio 5026do	3316do 6150do 9545do 3316do 4775af 7110do	6035af 7196do	9500af		0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800	vl vl	Myanmar, Radio 9730do Namibia, Namibian BC Corp New Zealand, R New Zealand Int New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do Nigeria, Radio/Ibadan 6050do	3270af 9885pa 7290do	3289af		
0600 0600 0600	0700 0700 0700 0700	as	UK, BBC World Service 6055af 9410eu 9740as 11760me 15360as 15485eu 15565eu UK, BBC World Service 17885af USA, Armed Forces Radio	6175am 11765af 17640af 4278va	6190af 11940af 17760as 4319va	6195eu 12095eu 17790as 4993va	7160af 15310as 21660as	0700 0700 0700 0700	0800 0800 0800 0800	vl vl	Nigeria, Radio/Kaduna 4770do Nigeria, Radio/Lagos 3326do Nigeria, Voice of 7255af Russia, Voice of Russia WS 17685au	6090do 4990do 11770af 15490au	7275do 15120na 17495au	9570do 17525au	17635au
	0700 0700 0700 0700 0700 0700 0700 070		6350va 6458va 6847va 13254va 13362va 16847va USA, KAID Dallas TX 5755va USA, KTBN Salt Lake City UT USA, KWHR Naralehu HI 11565pa USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WJCR Upton KY 7490am USA, WMLK Bethel PA 9465eu	7510na 17780as 5825na 11730af 5745va 13595as	10940va 7315am	12579va	12689va	0700 0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800	vl	Sierra Leone, Sierra Leone BS Singapore, SBC Radio One Solomon Islands, SIBC 5020do Sri Lanka, Sri Lanka BC Corp Taiwan, Radio Taipei International Uganda, Radio 5026do USA, Armed Forces Radio 6350va 6458va 6847va 13254va 13362va 16847va USA, KAIJ Dallas TX 5755va	3316do 6150do 9545do 3316do 5950na 7110do 4278va 10320va	7196do 4319va 10940va	4993va 12579va	5765va 12689va
0600 0600 0600 0600 0600 0600	0700 0700 0700 0700 0700 0700 0700	vl	USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na USA, WYCR Nashville TN USA, WYFR Okeechobee FL Vanuatu, Radio Yemen, Rep of Yemen Radio	7395am 11615af 3210na 5985na 4960do 9780me	13650af 5070na 7355eu 7260do	5935na	7460na	0700 0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800 0800		USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI 11565pa USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WJCR Upton KY 7490am USA, WMLK Bethel PA 9465eu	7510na 17780as 5825na 11730af 5745va 13595as	7315am		
0600 0600 0600 0605	0700 0700 0700 0610	vl vl mtwhfa	Zambia, Christian Voice 9865do Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp Croatia, The Voice of Croatia	6165do 5975do 6165eu	6265do 6045do 7365eu	9830eu	9925sa	0700 0700 0700 0700	0800 0800 0800 0800		USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na USA, WWCR Nashville TN	7395am 11615af 3210na	13650af 5070na	5935na	7460na
0610 0610	0615 0620	mtwhf mtwhf	11870am 13749na 17645as Vatican City, Vatican Radio 11740eu 15595eu Greece, Voice of 9420eu	4005eu	5885eu 15630eu	7250eu 17520pa	9645eu 21530eu	0700 0700 0700 0700	0800 0800 0800 0800	vl vl	USA, WYFR Okeechobee FL Vanuatu, Radio 3945do Zambia, Christian Voice 9865do Zambia, National BC Corp	7355eu 4960do 6165do	13695af 7260do 6265do	15170af	
0630 0630 0630 0630 0630	0640 0700 0700 0700 0700	vl t h as	Cameroon, CRTV Radio Buea Finland, YLE/Radio Finland Georgia, Georgian Radio USA, Voice of America 9530va USA, Voice of America 5970af	6005do 15315va 6080me 9680af 6035af	21670va 11805af 6080af	11965me 7195af	15205va	0700 0705 0715 0720 0730 0730	0800 0710 0800 0735 0800 0800	vl s mtwhf vl	Zimbabwe, Zimbabwe BC Corp Croatia, The Voice of Croatia Guam, KTWR/ Trans World R Swaziland, Trans World Radio Georgia, Georgian Radio Papua New Guinea, NBC	5975do 6165eu 15200as 4775af 11910eu 4890do	6045do 7365eu 6035af 9675irr	9830eu 9500af	13830eu
0630 0641 0645 0655	0700 0656 0655 0700	as	11995af12080af 13670af Vatican City, Vatican Radio Romania, R Romania International Monaco, Trans World Radio Monaco, Trans World Radio	11625af 11775eu 9870eu 9870eu	13765af 11940na	15570af 15180na	15365eu	0730 0730 0730	0800 0800 0800	as	rapua New Guinea, NBC. Switzerland, Swiss R International UK, BBC World Service 6190af 11940af 12095eu 15310as 17640eu 17760as 17790as UK, BBC World Service 15575as	15545af 9410eu 15360as 17830af 17885af	17685af 9740as 15400af 21660as	21750af 11760me 15485eu	11765af 15565eu
								0750 0755	0755 0800	as mtwhf	Greece, Voice of 9420eu Germany, Trans World Radio	11900au 12070eu	15630eu	17520as	21530as

			0800					1			0900				
0800	0805		Pakistan, Radio 17520eu	21465eu				0900	0915	vl	Ghana, Ghana BC Corp	3366do	4915do		
0800 0800 0800 0800 0800 0800	0805 0815 0820 0830 0830 0830 0830	vl vl vl	Guam, KTWR/ Trans World R Monaco, Trans World Radio Australia, ABC/Alice Springs Australia, ABC/Katherine Australia, ABC/Tennant Creek Australia, Radio 5995pa	15200as 9870eu 4835do 5025do 4910do 9710pa	12080va	13605ра	15240va	0900 0900 0900 0900 0900	0915 0929 0930 0930 0930	VI	Czech Rep, Radio Prague Intl Australia, Radio 11880as Guam, KTWR/ Trans World R UK, BBC World Service 6190af 11940af 11945as 12095eu 15485eu 15565eu 15575as	21745as 13605pa 15330as 6195as 15190sa 17640eu	15240as 9605as 15310as 17655as	21820as 9740as 15360as 17760as	11760me 15400af 17790as
0800 0800 0800 0800 0800 0800 0800 080	0830 0830 0830 0930 0900 0900 0900 0900	mtwhf vl	15415as 21725pa Molaysia, Voice of 6275as Myanmar, Radio 9730do Sierra Leone, Sierra Leone BS Sri Lanka, Sri Lanka BC Corp Anguilla, Caribbean Beacon Australia, Christian Voice Bhutan, Bhutan BC Service Botswana, Radio 7255do Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZV St John's NF Canada, CKZV St John's NF Canada, CKZV St John's NF Casta Rica, R for Peace Intl Costa Rica, University Network	9750as 3316do 3316do 6090am 17820as 6035do 7255do 6070do 6030do 6130do 6160do 6160do 7455irr 5030am	15295as 21680pa 9600do 15049va 6150am	7375am	9724sa	0900 0900 0900 0900 0900 0900 0900 090	0945 1000 1000 1000 1000 1000 1000 1000 10	vl vl vl	17830af 17885af 21470af Germany, Deutsche Welle 17715pa 17770pa 17800af Anguilla, Caribbean Beacon Australia, ABC/Kaltherine Australia, ABC/Katherine Australia, Christian Voice Botswana, Radio 7255do Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZU Yancouver BC China China Radio International Costa Rica, R for Peace Intl	21660as 6160pa 17820as 6090am 2310do 2485do 2325do 13755as 9600do 6070do 6030do 6130do 6160do 11730pa 7455irr	12035of 21560of 15210pa 15049va	15410af 21680pa	15470af 21790as
0800 0800 0800 0800 0800 0800 0800 080	0900 0900 0900 0900 0900 0900 0900 090	mtwhf as/vl o/monthly vl as/vl vl v	11870am 13749na 17645as Ecuador, HCJB Eqt Guinea, Radio Africa Eqt. Guinea, Radio East Africa Finland, Scandv Weekend Radio Germany, Deutsche Welle Germany, Overcomer Ministries Germany, Trans World Radio Germany, Voice of Hope 5975eu Ghana, Ghana BC Corp Guyana, Voice of 3289do Indonesia, Voice of 9525pa Italy, Italian Radio Relay Service Kenya, Kenya BC Corp Lesotho, Radio Liberia, ELWA 4760do Liberia, R Liberia International Malaysia, Radio Malta, Voice of Mediterranean Namibia, Namibian BC Corp New Zealand, R New Zealand Int New Zealand, ZIXA 3935do Nigeria, Radio/Ibadan Nigeria, Radio/Ibadan Nigeria, Radio/Kadana 4770do	21455usb 15185af 15185af 11690va 13640eu 13800pa 12070eu 21590me 3366do 5949do 11784pa 7120va 4915irr 5100do 11770eu 7165af 9885pa 7290do	13810au 4915do 15149pa 7215af 7275do	9570do		0900 0900 0900 0900 0900 0900 0900 090	1000 1000 1000 1000 1000 1000 1000 100	mtwhf as/vl as/vl a/monthly a  as/vl vl vl vl vl vl vl vl vl	Costa Rica, University Network 11870am 13749na 17645as Ecuador, HCJB 11775pa Eqt Guinea, Radio Africa Eqt. Guinea, Radio East Africa Finland, Scandv Weekend Radio Germany, Good News World R Germany, Overcomer Ministries Germany, Voice of Hope 5975eu Guyana, Voice of Hope Kerya, Kenya BC Corp Lesotho, Radio Relay Service Kenya, Kenya BC Corp Lesotho, Radio Liberia, Riberia International Malaysia, Radio Liberia, R Liberia International Malaysia, Radio Namibia, Namibian BC Corp New Zealand, R New Zealand Int New Zealand, R New Zealand Int New Zealand, R New Zealand Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna Nigeria, Radio/Kaduna Nigeria, Radio/Kaduna Nigeria, Radio/Lagos 3326do Nigeria, Radio/Lagos 3326do Palau, KHBN/Voice of Hope	5030am  21455usb 15185af 15185af 11690va 5985eu 13800pa 12070eu 21590me 5949da 7120va 4915irr  6100do 7165af 9885pa 7290do 6090da 4990da 15725as	6150am 5995eu 13810au 7215af 7275do	7375am	9724sa
0800 0800 0800 0800 0800 0800 0800 080	0900 0900 0900 0900 0900 0900 0900 090	vl vl s vl	Nigeria, Radio/Lagos 3226do Nigeria, Voice of Substantial State NBC Russia, Voice of Russia WS 17685au S Africa, Amateur Radio League Singapore, SBC Radio One Solomon Islands, SIBC 5020do South Korea, R Korea Intl	4990do 11770af 4890do 15490au 9750af 6150do 9570om	15120na 9675irr 17495au 21560af	17525αυ	17635au	0900 0900 0900 0900 0900 0900	1000 1000 1000 1000 1000 1000	vl vl	Papua New Guinea, NBC Singapore, SBC Radio One Solomon Islands, SIBC 5020do Sri Lanka, Sri Lanka BC Corp Uganda, Radio 5026do USA, Armed Forces Radio 6350va 6458va 6847va 13254va 13362va 16847va USA, KAIJ Dallas TX 5755va	4890do 6150do 6130do 7110do 4278va 10320va	9675irr 7196do 4319va 10940va	4993va 12579va	5765va 12689va
0800 0800	0900 0900 0900 0900 0900	as	Uganda, Radio 5026do UK, BBC World Service 15310as 15360as 15400af 17830af 17885af 21470af UK, BBC World Service 15575as USA, Armed Forces Radio 6350va 6458va 6847va 13254va 13362va 16847va	7110do 9740as 15485eu 21660as 4278va 10320va	7196do 11940af 15565eu 21830as 4319va 10940va	12095eu 17640eu 4993va 12579va	12095eu 17760as 5765va 12689va	0900 0900 0900 0900 0900 0900 0900 090	1000 1000 1000 1000 1000 1000 1000 100	mtwhfa	USA, KBN Salt Lake City UT USA, KBN Salt Lake City UT USA, KWHR Naalehu HI 11565pa USA, WewN Birmingham AL USA, WHRW Birmingham AL USA, WHRI Noblesville IN USA, WJCR Upton KY USA, WJCR Upton KY USA, WJCR MIA Miami FL 9955am	7510na 17780as 13610as 5825na 11730af 5745va 13595as	15150as 7315am		
0800 0800 0800 0800 0800 0800 0800 080	0900 0900 0900 0900 0900 0900 0900 090		USA, KAIJ Dallas TX 5755va USA, KRNLS Anchor Point AK USA, KTBN Solt Lake City UT USA, KWHR Naalehu HI 11565pa USA, Voice of America 11930as USA, WEWN Birminghom AL USA, WHRN Oblesville IN USA, WHRI Noblesville IN USA, WJCR Upton KY 7490am USA, WJCR Upton KY 7490am USA, WRNO New Orleans LA	11765as 7510na 17780as 13610as 5825na 11730af 5745va 13595as 7395am	15150as 7315am			0900 0900 0900 0900 0900 0900 0900 090	1000 1000 1000 1000 1000 1000 1000 100	vl mt hfa vl vl	USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na USA, WMCR Nashville TN Vanuatu, Radio 3945do Vatican City, Vatican Radio Zambia, Christian Voice 9865do Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp Greece, Voice of 12105eu Ghana, Ghana BC Corp	9455eu 2390na 4960do 5885eu 6165do 5975do 15630eu 6130do	9860eu 5070na 7260do 6265do 6045do 4915do	11615eu 5935na	7435na
0800 0800 0800 0800 0800 0800 0800 0810 0815	0900 0900 0900 0900 0900 0900 0900 0830 0900	vl vl vl s	USA, WSHB Cypress Crk SC USA, WTLC Newport NC 9370na USA, WWCR Nashville TN Vanuatu, Radio 3945do Zambia, Christian Voice 9865do Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp Armenia, Voice of 4810eu Guam, KTWR/ Trans World R	9845au 3210na 4960do 6165do 5975do 15270eu 15200as	9860eu 5070na 7260do 6265do 6045do 15330as	11615eu 5935na	7460na	0915 0930 0930 0930 0930	1000 1000 1000 1000	vl/as	Ghana, Ghana BC Corp Australia, Radio 11880as Netherlands, Radio 9790as UK, BBC World Service 6190af 12095eu 15190sa 15310as '5575as 17640eu 17760as 21660as Germany, Deutsche Welle	4915do	15240as 13710as 9740as 15400af 17830af	17750as 11760me 15485eu 17885af	
0815 0830 0830	0900 0900 0900	vl vl	Seychelles, FEBA Radio 15460as Australia, ABC/Alice Springs Australia, ABC/Katherine	2310do 2485do							1000				
0830 0830 0830 0830 0830 0830 0830	0900 0900 0900 0900 0900 0900 0900	vl	Australia, ABC/Tennant Creek Australia, Radio 5995pa 15415as 17750as 21725pa Austria, AWR Europe 17780af Georgia, Georgian Radio Italy/Adv World Radio Europe Lithuania, Radio Vilnius 9710eu Switzerland, Swiss R International	2325do 9710pa 11910me 9610eu 21770af	12080va	13605ра	15240va	1000 1000 1000 1000 1000 1000	1027 1030 1030 1030 1030 1030 1030		Vietnam, Voice of 12019as Guam, KSDA/ Adventist World R Netherlands, Radio 9790as Palau, KHBN/Voice of Hope Singapore, RTE Radio 11685au Sri Lanka, Sri Lanka BC Corp UK, BBC World Service 6190af	15115as 11560as 12065as 15725as 4940do 6195va	11705as 13710as 9740as	11760me	
	0900	S	Taiwan, CBS 11725as								12095eu 15310as 15360as 17760as 17790as 17885af	15485eu 21470af	15565eu 21660as	15575as	17640eu

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100		UK, BBC World Service 15190sa Anguilla, Caribbean Beacon	15400af 11775am				1100	1130 1130	as	UK, BBC World Service 6195am Ukraine, R Ukraine International	15190sa 12040eu	15220am 15135na		
100		Australia, ABC/Alice Springs	2310do				1100 1100	1145 1200		Germany, Deutsche Welle	11785af	15410af	17860af	21780af
100		Australia, ABC/Katherine Australia, ABC/Tennant Creek	2485do 2325do				1100	1200	vl	Anguilla, Caribbean Beacon Australia, ABC/Alice Springs	11775am 2310do			
100		Australia, Christian Voice Australia, Radio 11880as	13775as 13605pa	17825as 15240as	17750as	21820as	1100 1100	1200 1200	vl vl	Australia, ABC/Katherine Australia, ABC/Tennant Creek	2485do 2325do			
100	0 1100 as	Bhutan, Bhutan BC Service	6035do	1324003	1773003	2102003	1100	1200		Australia, Christian Voice	13775as	17825as		
100		Botswana, Radio 7255do Canada, CFRX Toronto ON	9600do 6070do				1100 1100	1200 1200	vl	Botswana, Radio 7255do Bulgaria, Radio 15700eu	9600do 17500eu			
100	0 1100	Canada, CFVP Calgary AB	6030do				1100	1200		Canada, CBC Northern Service	9625do			
100		Canada, CHNX Halifax, NS Canada, CKZN St John's NF	6130do 6160do				1100 1100	1200 1200		Canada, CFRX Toronto ON Canada, CFVP Calgary AB	6070do 6030do			
100	0 1100	Canada, CKZU Vancouver BC	6160do	15010			1100	1200		Canada, CHNX Halifax, NS	6130do			
100	0 1100	China China Radio International Costa Rica, R for Peace Intl	11730pa 7455irr	15210pa 15049va			1100 1100	1200 1200		Canada, CKZN St John's NF Canada, CKZU Vancouver BC	6160do 6160do			
100	0 1100	Costa Rica, University Network 11870am 13749na 17645as	5030am	6150am	7375am	9724sa	1100	1200 1200		Costa Rica, R for Peace Intl Costa Rica, University Network	7455irr 5030am	15049va 6150am	7375am	9724sa
100		Ecuador, HCJB 11755pa		)						11870am 13749na 17645as			7 3 7 3 dilli	// Z+3U
100		Eqt Guinea, Radio Africa Eqt. Guinea, Radio East Africa	15185af 15185af				1100	1200 1200	mtwhf	Ecuador, HCJB 12005am Eqt Guinea, Radio Africa	15115am 15185af	21455usb		
100	0 1100 a/monthl	y Finland, Scandv Weekend Radio	11690va				1100	1200	as/vl	Eqt. Guinea, Radio East Africa	15185af			
100		Germany, Deutsche Welle Germany, Sunshine Radio	13640eu 6015eu				1100 1100	1200 1200	a/monthly s	Finland, Scandv Weekend Radio Germany, Sunshine Radio	11690va 6015eu			
100		Germany, Voice of Hope 21590me Ghana, Ghana BC Corp	6130do				1100 1100	1200 1200	vl	Germany, Voice of Hope 21590me Ghana, Ghana BC Corp	6130do			
100	0 1100 vl/as	Ghana, Ghana BC Corp	4915do				1100	1200	vl/as	Ghana, Ghana BC Corp	4915do			
100		Guyana, Voice of 5949do India, All India Radio 11585as	13700au	15020as	15770au	17845au	1100 1100	1200 1200		Guyana, Voice of 5949do Iran, VOIRI 15385as 15430as	15585as	21470as	21730as	
		17840au 17895au					1100	1200	as/vl	Italy, Italian Radio Relay Service	7120va			
100		Italy, Italian Radio Relay Service Japan, Radio 9695pa	7120va 15590as	21755pa			1100 1100	1200 1200		Japan, Radio 6120na Jordan, Radio 11690eu	9695pa	15590as		
100		Jordan, Radio 11690eu Kenya, Kenya BC Corp 4885irr	4915irr				1100 1100	1200 1200	vl	Kenya, Kenya BC Corp 4885irr Lesotho, Radio 4800do	4915irr			
100	0 1100 vl	Lesotho, Radio 4800do	4713111				1100	1200	vl	Liberia, ELWA 4760do				
100		Liberia, ELWA 4760do Liberia, R Liberia International	6100do				1100 1100	1200 1200	vl	Liberia, R Liberia International Malaysia, Radio 7295do	6100do			
100	0 1100	Malaysia, Radio 7295do		7015 (			1100	1200		Malaysia, TRM Sarawak 7160do	73.45.6	7015 (		
100		Namibia, Namibian BC Corp New Zealand, R New Zealand Int	7165af 9885pa	7215af			1100 1100	1200 1200		Namibia, Namibian BC Corp New Zealand, ZLXA 3935do	7165af	7215af		
100	0 1100	New Zealand, ZLXA 3935do					1100 1100	1200 1200	vl	Nigeria, Radio/Enugu 6025do				
100		Nigeria, Radio/Enugu 6025do Nigeria, Radio/Ibadan 6050do					1100	1200	vl vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do	
100		Nigeria, Radio/Kaduna 4770do Nigeria, Radio/Lagos 4990do	6090do 7285do	7275do	9570do		1100 1100	1200 1200	vl	Nigeria, Radio/Lagos 4990do Palau, KHBN/Voice of Hope	7285do 9965as			
100	0 1100 vl	Papua New Guinea, NBC	4890do	9675irr			1100	1200	vl	Papua New Guinea, NBC	4890do	9675irr		
100		Singapore, SBC Radio One Solomon Islands, SIBC 5020do	6150do				1100 1100	1200 1200		Singapore, R Singapore Intl Switzerland, Swiss R International	6150as 13735as	9600as 21770as		
100	0 1100	Uganda, Radio 5026do	7110do	7196do	4000	57/5	1100	1200		Taiwan, Radio Taipei International	7445as	11905as		
100	0 1100	USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va	1100 1100	1200 1200		Taiwan, Voice of Asia 7445as Uganda, Radio 5026do	7110do	7196do		
100	0 1100	13254va 13362va 16847va USA, KAIJ Dallas TX 5755va					1100	1200		UŠA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va
100	0 1100	USA, KTBN Salt Lake City UT	7510na							13254va 13362va 16847va	1032000	1094000	1237900	1200910
100		USA, KWHR Naalehu HI 9930as USA, Voice of America 6165am	11565pa 7370am	9590am	9770na	15240as	1100	1200 1200		USA, KAIJ Dallas TX 5755va USA, KTBN Salt Lake City UT	7510na			
		15425as			,,,opa	102 1000	1100	1200		USA, KWHR Naalehu Hl 9930as	11565pa	07/0	0770	15170
100		USA, WEWN Birmingham AL USA, WHRI Noblesville IN	7425na 6040na	15745eu 9495am			1100	1200		USA, Voice of America 6160as 15240as 15425as	9645as	9760as	9770pa	15160as
100		USA, WJCR Upton KY 7490am USA, WRMI Miami FL 9955am	13595as				1100 1100	1200 1200		USA, WEWN Birmingham AL USA, WHRI Noblesville IN	7425na 6040na	15745eu 9495am		
100	0 1100	USA, WRNO New Orleans LA	7395am				1100	1200	a s	USA, WINB Red Lion PA 13750am		747Juiii		
100		USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na	6095am	9455sa	11870as		1100 1100	1200 1200	mtwhfa	USA, WJCR Upton KY 7490am USA, WRMI Miami FL 9955am	13595as			
100	0 1100	USA, WWCR Nashville TN	5070na	5935na	7435na	9475na	1100	1200		USA, WRNO New Orleans LA	7395am	0.455	11500	11//0
100		USA, WYFR Okeechobee FL Vanuatu, Radio 3945do	5950na 4960do	7260do			1100 1100	1200 1200		USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na	6095am	9455am	11590am	1166Uam
100		Zambia, Christian Voice 9865do Zambia, National BC Corp	6165do	6265do			1100 1100	1200 1200		USA, WWCR Nashville TN USA, WYFR Okeechobee FL	5070na 5850na	5935na 5950na	7435na	15685na
100	0 1100 vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do			1100	1200	vl/s	Vanuatu, Radio 3945do	4960do	7260do		
100	000 1030 0 1035	Switzerland, Swiss R International Israel, Kol Israel 15640va	15315eu 17545va				1100 1100	1200 1200	vl	Zambia, Christian Voice 9865do Zambia, National BC Corp	6165do	6265do		
103	0 1045 mtwhf	Ethiopia, Radio 5990do Guam, KSDA/ Adventist World R	7110do 11560as	9705do			1100 1105	1200 1200	vl	Zimbabwe, Zimbabwe BC Corp New Zealand, R New Zealand Int	5975do 11675as	6045do		
103	0 1100	Malaysia, RTM Sarawak 7160do	1150008				1115	1145		Nepal, Radio 5005as 7165as				
103		Mongolia, Voice of 12085au Netherlands, Radio 6045eu	9760as	9860eu	12065as	13710as	1120 1130	1140 1145	w vl	Kazakhstan, Radio Almaty Libya, Voice of Africa 11815af	9620eu 15435af	11840eu 17725af		
103		Palau, KHBN/Voice of Hope Sri Lanka, Sri Lanka BC Corp	9965as	15725as			1130	1200		Australia, Radio 5995pa	6020pa	9475as	9580va	11650pa
103		Srilanka Srilanka BUU oro	4940do	11835as 15395eu	15120as	17850as	1130	1200	а	11880as 12080va 13605va Austria, R Austria International	21820as 6155eu	13730eu		
103	0 1100	UAE, Radio Dubai 13675eu	15370eu	1337360			1130	1200						
		UAE, Radio Dubai 13675eu UK, BBC World Service 6190af	6195va	9740as		11760me 17640eu				Belgium, RVI Flanders R Intl Netherlands Radio 6045eu	9865as 9860eu	9925eu		
	0 1100	UAE, Radio Dubai 13675eu	6195va		11760me 15575as		1130 1130	1200 1200		Netherlands, Radio 6045eu South Korea, R Korea Intl	9860eu 9650na	9925eu		
	0 1100	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940af 12095eu 15310as 17790as 17885af 21470af	6195va	9740as			1130	1200		Netherlands, Radio 6045eu	9860eu	9925eu		
	0 1100	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940af 12095eu 15310as	6195va	9740as			1130 1130 1130	1200 1200 1200		Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af	9860eu 9650na 4940do 18960na 6195as	9740as	9815as	11760me
103	0 1100 0 1100	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940bf 12095eu 15310os 17790as 17885af 21470af  1100	6195va 15485eu	9740as			1130 1130 1130 1130 1130	1200 1200 1200 1200 1200		Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af 11940af 11955as 12095eu 15575as 17640eu 17700as	9860eu 9650na 4940do 18960na 6195as 15220am 17830af		9815as 15310as 21470af	11760me 15485eu
	0 1100 0 1100	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940af 12095eu 15310as 17790as 17885af 21470af	6195va	9740as			1130 1130 1130 1130 1130	1200 1200 1200 1200 1200 1200	f	Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af 11940af 11955as 12095eu 15575as 17640eu 17700as Ukraine, R Ukraine Intermational	9860eu 9650na 4940do 18960na 6195as 15220am 17830af 15135na	9740as 15280as 17885af	15310as	
110	0 1100 0 1100 0 1105 0 1105 0 1120 fa	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940bf 12095eu 15310os 17790as 17885af 21470af  1100  New Zealand, R New Zealand Int Pakistan, Radio 17520eu Kazakhstan, Radio Almaty	6195va 15485eu 9885pa	9740as			1130 1130 1130 1130 1130 1130 1130 1140	1200 1200 1200 1200 1200 1200 1200 1200	f	Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af 11940af 11955as 12095eu 15575as 17640eu 17700as Ukraine, R Ukraine International Vatican City, Vatican Radio Kazakhstan, Radio Almaty	9860eu 9650na 4940do 18960na 6195as 15220am 17830af 15135na 15595va 9620eu	9740as 15280as	15310as	
110	0 1100 0 1100 0 1105 0 1105 0 1120 fa	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940bf 12095eu 15310os 17790as 17885af 21470af  T100  New Zealand, R New Zealand Int Pakistan, Radio 17520eu Kazakhstan, Radio Almaty Vietnam, Voice of 7285as Australia, Radio 5995pa Australia, Radio 5995pa	9885pa 21465eu 6020pa	9740as 15565eu 11840eu 9475as			1130 1130 1130 1130 1130 1130 1130 1140	1200 1200 1200 1200 1200 1200		Neiħerlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af 11940af 11955as 12095eu 15575as 17640eu 17700as Ukraine, R Ukraine International Vatican City, Vatican Radio	9860eu 9650na 4940do 18960na 6195as 15220am 17830af 15135na 15595va	9740as 15280as 17885af 17515va	15310as	
110 110 110 110	0 1100 0 1100 0 1105 0 1105 0 1120 fa 0 1127 0 1130	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940bf 12095eu 15310os 17790as 17885af 21470af  1100  New Zealand, R New Zealand Int Pakistan, Radio 17520eu Kazakhstan, Radio Almaty Vietnam, Voice of 7285as Australia, Radio 5995pa 11880as 12080va 13605va	9885pa 21465eu 6020pa 15240as	9740as 15565eu 11840eu 9475as 21820as	15575as 9580va	17640eu	1130 1130 1130 1130 1130 1130 1130 1140	1200 1200 1200 1200 1200 1200 1200 1200		Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af 11940af 11955as 12095eu 15575as 17640eu 17700as Ukraine, R Ukraine International Vatican City, Vatican Radio Kazakhstan, Radio Almaty Germany, Deutsche Welle	9860eu 9650na 4940do 18960na 6195as 15220am 17830af 15135na 15595va 9620eu	9740as 15280as 17885af 17515va	15310as	
110 110 110 110 110 110	00 1100 1100 1100 100 1105 100 1120 fa 100 1120 100 1130 100 1130	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940bf 12095eu 15310os 17790as 17885af 21470af  T100  New Zealand, R New Zealand Int Pakistan, Radio 17520eu Kazakhstan, Radio Almaty Vietnam, Voice of 7285as Australia, Radio 5995pa 11880as 12080va 13605va Netherlands, Radio 6045eu Sri Lanka, Sri Lanka BC Corp	9885pa 21465eu 9620eu 6020pa 15240as 9790as 4940do	9740as 15565eu 11840eu 9475as 21820as 9860eu 11835as	15575as	17640eu	1130 1130 1130 1130 1130 1130 1130 1140	1200 1200 1200 1200 1200 1200 1200 1200		Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af 11940af 11955as 12095eu 15575as 17640eu 17700as Ukraine, R Ukraine International Vatican City, Vatican Radio Kazakhstan, Radio Almaty	9860eu 9650na 4940do 18960na 6195as 15220am 17830af 15135na 15595va 9620eu	9740as 15280as 17885af 17515va	15310as	
110	0 1100 0 1100 0 1100 0 1105 0 1120 fa 0 1127 0 1130 0 1130 0 1130 0 1130 mtwhf	UAE, Radio Dubai 13675eu UK, BBC World Service 190at 11940af 12095eu 15310as 17790as 17885af 21470af  T100  New Zealand, R New Zealand Int Pakistan, Radio 17520eu Kazakhstan, Radio 17520eu Kazakhstan, Radio 3995pa 11880as 12080va 13605va Netherlands, Radio 6045eu Sri Lanka, Sri Lanka BC Corp UK, BBC Caribbean Report UK, BBC World Service 6190af	9885pa 21465eu 9620eu 6020pa 15240as 9790as 4940do 6195cs	9740as 15565eu 11840eu 9475as 21820as 9860eu 11835as 15220ca 9740as	9580va 12065as 15210as 9815as	11650pa 13710as 17850as 11760me	1130 1130 1130 1130 1130 1130 1140 1145	1200 1200 1200 1200 1200 1200 1200 1200		Neiherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri	9860eu 9650na 4940da 18960na 6195as 15220am 17830af 15135na 15595va 9620eu 13640eu	9740as 15280as 17885af 17515va 11840eu	15310as 21470af	15485eu
110 110 110 110 110 110 110	0 1100 0 1100 0 1100 0 1105 0 1120 fa 0 1127 0 1130 0 1130 0 1130 0 1130 mtwhf	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940bf 12095eu 15310as 17790as 17885af 21470af  T100  New Zealand, R New Zealand Int Pakistan, Radio 17520eu Kazakhstan, Radio Almaty Vietnam, Voice of 7285as Australia, Radio 5995pa 11880as 12080va 13605va Netherlands, Radio 6045eu Sri Lanka, Sri Lanka BC Corp UK, BBC Caribbean Report	9885pa 21465eu 9620eu 6020pa 15240as 9790as 4940do 6195ca	9740as 15565eu 11840eu 9475as 21820as 9860eu 11835as 15220ca	9580va 12065as 15210as	11650pa 13710as 17850as	1130 1130 1130 1130 1130 1130 1140 1145	1200 1200 1200 1200 1200 1200 1200 1200	t	Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp Sweden, Radio 17505as UK, BBC World Service 6190af 11940af 11955as 12095eu 15575as 17640eu 17700as Ukraine, R Ukraine International Vatican City, Vatican Radio Kazakhstan, Radio Almaty Germany, Deutsche Welle	9860eu 9650na 4940do 18960na 6195as 15220am 17830af 15135na 15595va 9620eu 13640eu	9740as 15280as 17885af 17515va 11840eu	15310as	
110 110 110 110 110 110 110	0 1100 0 1100 0 1100 0 1105 0 1120 fa 0 1127 0 1130 0 1130 0 1130 0 1130 mtwhf	UAE, Radio Dubai 13675eu UK, BBC World Service 6190af 11940bf 12095eu 15310as 17790as 17885af 21470af  T100  New Zealand, R New Zealand Int Pakistan, Radio 17520eu Kazakhstan, Radio Almaty Vietnam, Voice of 7285as Australia, Radio 5995pa 11880as 12080va 13605va Netherlands, Radio 6045eu Sri Lanka, Sri Lanka BC Corp UK, BBC Caribbean Report UK, BBC World Service 6190af 11940af 11955as 12095eu	9885pa 21465eu 9620eu 6020pa 15240as 9790as 4940do 6195ca 6195as 15280as	9740as 15565eu 11840eu 9475as 21820as 9860eu 11835as 15220ca 9740as 15310as	9580va 12065as 15210as 9815as 15400af	11650pa 13710as 17850as 11760me 15485eu	1130 1130 1130 1130 1130 1130 1140 1145	1200 1200 1200 1200 1200 1200 1200 1200	t	Netherlands, Radio 6045eu South Korea, R Korea Intl Sri Lanka, Sri	9860eu 9650na 4940da 18960na 6195as 15220am 17830af 15135na 15595va 9620eu 13640eu	9740as 15280as 17885af 17515va 11840eu	15310as 21470af 9815as	15485eu

1200 1200 1200	1220 as 1225 1230 1230	UK, BBC World Service 6195am Netherlands, Radio 6045eu France R France International Iran, VOIRI 15385as 15430as	15220am 9860eu 15540eu 15585as	25820af 21470as	21730as		1245 1245 1255	1300 1300 1300	a mtwhfa	Seychelles, FEBA Radio 15535me USA, WYFR Okeechobee FL Taiwan, CBS 6180as 7250as	17750na 9630as	11725as	11775as	
	1230 1230	Philippines, FEBC 15110as Sri Lanka, Sri Lanka BC Corp	4940do							1300				<u> </u>
1200 1200 1200	1230 1230 1245 1255 1256	Switzerland, Swiss R International Uzbekistan, Radio Tashkent USA, WYFR Okeechobee FL Poland, Radio Polonia 6095eu North Korea, Voice of Korea	15315eu 7285as 5850na 7270eu 3560va	9715as 5950na 9525eu 9640va	15295as 17750na 11820eu 9850va	17775as 9975va	1300 1300 1300	1305 1329 1330		New Zealand, R New Zealand Int Czech Rep, Radio Prague Intl Australia, Radio 5995pa	11675as 13580eu 6020pa	21745as 9475as	9580va	11650va
1200 1200 1200 1200	1300 1300 vl 1300 vl 1300 vl	11334va 13650va Anguilla, Caribbean Beacon Australia, ABC/Alice Springs Australia, ABC/Katherine Australia, ABC/Tennant Creek	11775am 2310do 2485do 2325do				1300 1300 1300 1300	1330 1330	S	11880as 21820as Egypt, Radio Cairo 17595as Germany, Universal Life 9955na Guam, KSDA/ Adventist World R Turkey, Voice of 17810as	15385as 17830eu			
1200 1200 1200 1200	1300 1300 1300 1300 vl 1300 vl	Australia, Christian Voice Australia, Radio 5995pa 11880as 21820as Bangladesh, Bangla Betar Botswana, Radio 7255do Canada, CBC Northern Service	13775as 6020pa 7185as 9600do 9625do	13795as 9475as 9550as	9580as	11650va	1300 1300 1300 1300 1300 1300 1300	1400 1400 1400 1400 1400 1400 1400	vl vl vl	Anguilla, Caribbean Beacon Australia, ABC/Alice Springs Australia, ABC/Katherine Australia, ABC/Tennant Creek Australia, Christian Voice Botswana, Radio 7255do	11775am 2310do 2485do 2325do 13775as 9600do	13795as		
1200 1200 1200 1200 1200	1300 1300 1300 1300 1300 1300	Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CHNX Halifax, NS Canada, CKZN St John's NF Canada, CKZU Vancouver BC Canada, R Canada International	6070do 6030do 6130do 6160do 6160do 9660as	15190as			1300 1300 1300 1300 1300	1400 1400 1400 1400 1400		Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CHNX Halifax, NS Canada, CKZN St John's NF Canada, CKZU Vancouver BC	9625do 6070do 6030do 6130do 6160do 6160do			
1200	1300 mtwhf 1300	Canada, R Canada International China China Radio International 15415pa Costa Rica, R for Peace Intl	9640am 9730as 7455irr	9640am 9760pa 21815usb	11675pa	17820am 11980as	1300 1300 1300 1300	1400 1400 1400 1400	mtwhf as	Canada, R Canada International Canada, R Canada International Canada, R Canada International China China Radio International	9640am 17820am 17800am 7405na	15305am 9570na	11675pa	11900pa
1200	1300 1300 1300 as/vl	Costa Rica, University Network 11870am 13749na 17645as Ecuador, HCJB 12005am Egt. Guinea, Radio East Africa	5030am 15115am 15185af	6150am 21455usb	7375am	9724sa	1300 1300 1300	1400 1400 1400		11980as 15180as China, Voice of Hope 13820as Costa Rica, R for Peace Intl Costa Rica, University Network	15049irr 5030am	21815usb 6150am	7375am	9724sa
1200 1200 1200	1300 a/monthly 1300 1300 s 1300		11720va 13640eu 6015eu				1300 1300 1300	1400 1400 1400	as/vl a/monthly	11870am 13749na 17645as Ecuador, HCJB 12005am Eqt. Guinea, Radio East Africa Finland, Scandv Weekend Radio	15115am 15185af 11720va	21455usb		
1200 1200 1200	1300 vl 1300 1300 as/vl 1300	Ghana, Ghana BC Corp Guyana, Voice of 5949do Italy, Italian Radio Relay Service Jordan, Radio 11690eu	4915do 7120va	6130do			1300 1300 1300 1300	1400 1400 1400 1400	s	Germany, Deutsche Welle Germany, Overcomer Ministries Germany, Sunshine Radio Germnay, Voice of Hope 15715me	13640eu 6110eu 6015eu	13810af		
1200	1300 1300 vl	Kenya, Kenya BC Corp 4885irr Lesotho, Radio 4800do	4915irr				1300 1300	1400 1400	vl	Ghana, Ghana BC Corp Guyana, Voice of 5949do	4915do	6130do		
1200	1300 vl 1300 vl	Liberia, ELWA 4760do Liberia, R Liberia International	6100do				1300 1300	1400 1400	as/vl	Italy, Italian Radio Relay Service Jordan, Radio 11690eu	7120va			
1200 1200 1200	1300 1300 1300	Malaysia, Radio 7295do Namibia, Namibian BC Corp New Zealand, R New Zealand Int	7165af 11675as	7215af			1300 1300 1300	1400 1400 1400	vl vl	Kenya, Kenya BC Corp 4885irr Lesotho, Radio 4800do Liberia, ELWA 4760do	4915irr			
1200 1200	1300 1300 vl 1300 vl 1300 vl	New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do		1300 1300 1300 1300	1400 1400 1400 1400	vl	Liberia, R Liberia International Malaysia, Radio 7295do Namibia, Namibian BC Corp New Zealand, ZLXA 3935do	6100do 7165af	7215af		
1200 1200 1200	1300 vl 1300 vl	Nigeria, Radio/Lagos 4990do Palau, KHBN/Voice of Hope Papua New Guinea, NBC	7285do 9965as 4890do	9675irr	737000		1300 1300 1300	1400 1400 1400	vl vl vl	Nigeria, Radio/Enugu 6025do Nigeria, Radio/Kaduna 4770do Nigeria, Radio/Lagos 4990do	6090do 7285do	7275do	9570do	
1200 1200	1300 1300 1300 1300	Singapore, R Singapore Intl Taiwan, Radio Taipei Internationa Uganda, Radio 5026do USA, Armed Forces Radio	6150as 7130as 7110do 4278va	9600as 9610au 7196do 4319va	4993va	5765va	1300 1300 1300 1300	1400 1400 1400 1400	vl as	Palau, KHBN/Voice of Hope Papua New Guinea, NBC S Africa, Channel Africa 11720af Singapore, R Singapore Intl	9965as 4890do 17780af 6150as	9675irr 21725af 9600as		
	1300 1300	6350va 6458va 6847va 13254va 13362va 16847va USA, KAIJ Dallas TX 13815va USA, KTBN Salt Lake City UT	10320va 7510na	10940va	12579va	12689va	1300 1300	1400 1400 1400		South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp 15425as Uganda, Radio 4976do	9570as 4940do 5026do	13670om 6005as	6075as	9770as
1200 1200	1300 1300 1300	USA, KWHR Naalehu HI 9930as USA, Voice of America 6160as 15425as USA, WEWN Birmingham AL	11565pa 9645as 7425na	9760as 15745eu	15160as	15240as	1300	1400		UK, BBC World Service 6190af 12095eu 12095eu 15220am 15575me 17640eu 17700as USA, Armed Forces Radio	9740as 15310as 17830af 4278va	9815as 15420af 17885af 4319va	11760me 15485eu 21470af 4993va	11940af 15565eu 5765va
1200 1200 1200	1300 1300 1300 1300 1300 mtwhfa	USA, WHRI Noblesville IN USA, WINB Red Lion PA 13570am USA, WJCR Upton KY 7490am USA, WRMI Miami FL 15724na	6040na	9495am			1300	1400		6350va 6458va 6847va 13254va 13362va 16847va USA, KAIJ Dallas TX 13815va USA, KJES Vado NM 11715na	10320va		12579va	12689va
1200 1200 1200	1300 s 1300 1300	USA, WRMI Miami FL 9955am USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC 11660am 17635as	7395am 6095am	9455am	9875as	11590am	1300 1300 1300 1300	1400 1400 1400 1400		USA, KNLS Anchor Point AK USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI 9930as USA, Voice of America 6160as	11870as 7510na 11565pa 9645as	9760as	15160as	15425as
1200 1200 1200	1300 1300 1300 1300 vl/s	USA, WTJC Newport NC 9370na USA, WWCR Nashville TN USA, WWFV McCaysville GA Vanuatu, Radio 3945do	7435na 12172va 4960do	12160na 7260do	13845na	15685na	1300 1300 1300 1300	1400 1400 1400 1400	a	USA, WBCQ Monticello ME USA, WEWN Birmingham AL USA, WHRI Noblesville IN USA, WINB Red Lion PA 13570am	17495na 11875na 6040na	15105am		
1200 1200 1205	1300 1300 vl 1300 vl 1210	Zambia, Christian Voice 9865do Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp Croatia, The Voice of Croatia	6165do 5975do 6165eu	6265do 6045do 9830eu	13830eu		1300 1300 1300 1300	1400 1400 1400 1400	mtwhfa s	USA, WJCR Upton KY 7490am USA, WRMI Miami FL 15724na USA, WRMI Miami FL 9955am USA, WRNO New Orleans LA	13595as 7395am	0.45-		
1215	1300 1300	Egypt, Radio Cairo 17595as UK, BBC World Service 6190af 11940af 11955as 12095eu 15565eu 15575as 17640eu	6195as 15220am 17700as	9740as 15280as	9815as 15310as 17885af	11760me 15485eu 21470af	1300 1300 1300 1300	1400 1400 1400 1400		USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na USA, WWCR Nashville TN USA, WWFV McCaysville GA	9430na 9475na 12172va		9940as 13845na	15685na
1230 1230 1230	1257 1300 1300 1300 1300	Vietnam, Voice of 12019as Finland, YLE/Radio Finland Germany, Overcomer Ministries Italy/Adv World Radio Europe Sri Lanka, Sri Lanka BC Corp	15115as 15400na 6110eu 9610eu 4940do	17670na 6005as	6075as	9770as	1300 1300 1300 1300 1305	1400 1400 1400 1400 1400	vl vl occsnal	USA, WYFR Okeechobee FL Zambia, Christian Voice 9865do Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp New Zealand, R New Zealand Int	11550as 6165do 5975do 6095pa	11830na 6265do 6045do	11970na	17750na
1230 1230	1300 1300	15425as Sweden, Radio 17505as Thailand, Radio 9655as	18960na 9885as	21530as 11905as	007308	/// ous	1325 1330 1330	1400 1357 1400	Securior	Germany, Voice of Hope 17550as Vietnam, Voice of 9730eu Australia, Radio 5995pa	11630eu 6020pa	13740eu 9475as	9580va	11650va
1230	1300 1300 a	Turkey, Voice of 17810as UK, Wales Radio Intl/Merlin					1330 1330	1400 1400	s	11660as 21820as Austria, R Austria International Guam, KSDA/ Adventist World R	6155eu 11705as	13730eu 11980as	21789as	

1330	1400		India, All India Radio 9690as	11620as	13710as			1400	1500	.1	Zambia, Christian Voice 9865do	/1/E-L-	/0/E.L.		
1330 1330	1400 1400		Sweden, Radio 17505va UAE, Radio Dubai 13630eu	18960na 13675eu	15395eu	21605eu		1400 1400	1500 1500		Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp	6165do 5975do	6265do 6045do0		
1330	1400		UK, BBC World Service 6190af 11940af 12095eu 15220am	6195va 15310as	9740as 15420af	9815as 15485eu	11760me 15565eu	1415 1430	1420 1500		Nepal, Radio 5005as 7165as Guam, KTWR/ Trans World R	15330as			
1330	1400		15575me 17640eu 17700as Uzbekistan, Radio Tashkent	17830af 7285as	17885af 9715as	21470af 15295as	17775as	1430 1430	1500 1500		Malaysia, RTM Kota Kinabalu Myanmar, Radio 5985do	5980do			
1000	1-100		Ozbokisian, kadio rashkem	720003	771003	102/003	1777503	1430	1500		Netherlands, Radio 9890as	11835as	12075as		
			1400					.			1500				
1400	1430			15115am	21455usb			-							
1400 1400	1430 1430		Guam, KSDA/ Adventist World R Thailand, Radio 9655as	17720as 9830as	11905as			1500 1500	1530 1530		Australia, Radio 5995va Germany, Voice of Hope 17550as	9580va	11650va	11660as	
1400 1400	1430 as	S	UK, BBC World Service 15245as USA, Voice of America 18275va					1500 1500	1530 1530		Mexico, R Mexico International Mongolia, Voice of 12015as	9705am 12085as	11770am		
1400	1456		Romania, R Romania Internationa		17735eu			1500	1530		S Africa, Channel Africa 17770af	1200503			
1400 1400	1500 1500 vl		Anguilla, Caribbean Beacon Australia, ABC/Alice Springs	11775am 2310do				1500 1500	1530 1530	а	Seychelles, FEBA Radio 11600as UK, BBC World Service 5975as	6190af	6195as	9740as	11860af
1400 1400	1500 vl 1500 vl		Australia, ABC/Katherine Australia, ABC/Tennant Creek	2485do 2325do							11940af 12095eu 15310as 17700as 17830af 17840an		15420af 21490af	15485eu 21660af	15565eu
1400 1400	1500 1500		Australia, Christian Voice	13730as	13795as			1500	1530		USA, VOA Special English	6160as	9590as	9760as	9845as
1400	1500 vl		Australia, Radio 5995va Botswana, Radio 7255do	9580va 9600do	11660as			1500	1556		12040as 15550as North Korea, Voice of Korea	4405va	6574na	9335na	11710na
1400 1400	1500 vl 1500		Cameroon, CRTV Radio Buea Canada, CBC Northern Service	6005do 9625do				1500	1559		13760na Canada, R Canada International	15455as	17720as		
1400 1400	1500 1500		Canada, CFRX Toronto ON Canada, CFVP Calgary AB	6070do 6030do				1500 1500	1559 1600	as	Canada, R Canada International Anguilla, Caribbean Beacon	9640am 11775am	15305am	17800am	
1400	1500		Canada, CHNX Halifax, NS	6130do				1500	1600		Australia, ABC/Alice Springs	2310do			
1400 1400	1500 1500		Canada, CKZN St John's NF Canada, CKZU Vancouver BC	6160do 6160do				1500 1500	1600 1600		Australia, ABC/Katherine Australia, ABC/Tennant Creek	2485do 2325do			
1400 1400	1500 1500 m	ntwhf	Canada, R Canada International Canada, R Canada International	9640am 17820am	15305am			1500 1500	1600 1600	vl	Australia, Christian Voice Botswana, Radio 7255do	13730as 9600do	13795as		
1400 1400	1500 as		Canada, R Canada International China China Radio International	17800am 7180as	7405na	9700as	11675as	1500 1500	1600 1600		Canada, CBC Northern Service Canada, CFRX Toronto ON	9625do 6070do			
			11765as 13685af 15125af	7 100us	7403110	// 00ds	1107503	1500	1600		Canada, CFVP Calgary AB	6030do			
1400 1400	1500 1500		China, Voice of Hope 13820as Costa Rica, R for Peace Intl	15049irr	21815usb			1500 1500	1600 1600		Canada, CHNX Halifax, NS Canada, CKZN St John's NF	6130do 6160do			
1400	1500		Costa Rica, University Network 11870am 13749na 17645as	5030am	6150am	7375am	9724sa	1500 1500	1600 1600		Canada, CKZU Vancouver BC China China Radio International	6160do 7160as	7405na	9785as	13685af
1400 1400		s/vl /monthly	Eqt. Guinea, Radio East Africa Finland, Scandv Weekend Radio	15185af 11720va				1500	1600		15125af China, Voice of Hope 13820as				
1400	1500	/ IIIOIIIIIIy	France R France International	11610me	17620as			1500	1600		Costa Rica, R for Peace Intl	15049irr	21815usb	7075	0704
1400 1400	1500 1500 as	s	Germany, Deutsche Welle Germany, Overcomer Ministries	13640eu 17490eu				1500	1600		Costa Rica, University Network 11870am 13749na 17645as	5030am	6150am	7375am	9724sa
1400 1400	1500 1500		Germany, Overcomer Ministries Germany, Voice of Hope 15715me	6110eu 17550as	13810af			1500 1500	1600 1600	as/vl a/monthly	Eqt. Guinea, Radio East Africa Finland, Scandv Weekend Radio	15185af 11720va			
1400 1400	1500 vl 1500		Ghana, Ghana BC Corp Guyana, Voice of 5949do	4915do	6130do			1500 1500	1600 1600	as	Germany, Deutsche Welle Germany, Overcomer Ministries	13640eu 17490eu			
1400 1400	1500	s/vl	India, All India Radio 9690as Italy, Italian Radio Relay Service	11620as 7120va	13710as			1500 1500	1600 1600		Germany, Overcomer Ministries Germany, Voice of Hope 15715me	5110eu	13810af		
1400	1500	5/ VI	Japan, Radio 7200pa	9505na	11730as	17755me		1500	1600	vl	Ghana, Ghana BC Corp	4915do	6130do		
1400 1400	1500 1500		Jordan, Radio 11690na Kenya, Kenya BC Corp 4885irr	17680al 4915irr				1500 1500	1600 1600		Guam, KTWR/ Trans World R Guyana, Voice of 5949do	15330as			
1400 1400	1500 vl 1500 vl		Lesotho, Radio 4800do Liberia, ELWA 4760do					1500 1500	1600 1600		Japan, Radio 7200pa Jordan, Radio 11690na	9750as 17680al	11730as		
1400 1400	1500 vl 1500		Liberia, R Liberia International Malaysia, Radio 7295do	6100do				1500 1500	1600 1600	vl	Kenya, Kenya BC Corp 4885irr Lesotho, Radio 4800do	4915irr			
1400 1400	1500		Malaysia, RTM Sarawak 7160do Namibia, Namibian BC Corp	7146-4	7015-4			1500 1500	1600	vl	Liberia, ELWA 4760do	41004-			
1400		ccsnal	New Zealand, R New Zealand Int	7165af 6095pa	7215af			1500	1600 1600	VI	Liberia, R Liberia International Malaysia, Radio 7295do	6100do			
1400 1400	1500 1500 vl		New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do					1500 1500	1600 1600		Malaysia, RTM Kota Kinabalu Malaysia, RTM Sarawak 7160do	5980do			
1400 1400	1500 vl 1500 vl		Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do		1500 1500	1600 1600		Myanmar, Radio 5985do Namibia, Namibian BC Corp	7165af	7215af		
1400 1400	1500 vl 1500		Nigeria, Radio/Lagos 4990do Oman, Radio Sultanate of	7285do 15140va				1500 1500	1600 1600	occsnal	Netherlands, Radio 9890as New Zealand, R New Zealand Int	11835as 6095pa	12075as		
1400 1400	1500 1500		Palau, KHBN/Voice of Hope Russia, Voice of Russia WS	9965as	10055	15510		1500 1500	1600 1600		New Zealand, ZLXA 3935do	оолора			
1400	1500 as	S	S Africa, Channel Africa 11720af	9495as 17780af	12055as 21725af	15510as		1500	1600	vl	Nigeria, Radio/Ibadan 6050do	(000.1	70751	05701	
1400 1400	1500 1500		Singapore, SBC Radio One Sri Lanka, Sri Lanka BC Corp	6150do 4940do	6005as	6075as	9770as	1500 1500	1600 1600		Nigeria, Radio/Kaduna 4770do Nigeria, Radio/Lagos 4990do	6090do 7285do	7275do	9570do	
1400	1500		15425as Switzerland, Swiss R International	9575as	17680as			1500	1600		Russia, Voice of Russia WS 9730eu 11500as 11985me	4940me	4965me	4975me	7325me
1400 1400	1500 1500		Taiwan, Radio Taipei International Uganda, Radio 4976do	15265as 5026do				1500 1500	1600 1600		Singapore, SBC Radio One Sri Lanka, Sri Lanka BC Corp	6150do 4940do	6005as	6075as	9770as
1400	1500		UK, BBC World Service 6190af 12095eu 15310as 15485eu	6195as 15565eu	9740as 15575me	9815as	11940af 17700as	1500	1600		15425as Uganda, Radio 4976do	5026do			
1.400	1500		17830af 17840am 21470af	21660af				1500	1600	S	UK, Merlin Network One 6175eu		4210	1000	57/5
1400	1500		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va	1500	1600		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va
1400	1500		13254va 13362va 16847va USA, KAIJ Dallas TX 13815va					1500	1600		13254va 13362va 16847va USA, KAIJ Dallas TX 13815va				
1400 1400	1500 1500		USA, KJES Vado NM 11715na USA, KTBN Salt Lake City UT	7510na				1500 1500	1600 1600		USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI 9930as	15590na 11565pa			
1400	1500		USA, KWHR Naalehu HI 9930as	11565pa	0445	0740	15140	1500	1600		USA, Voice of America 7125as	9645as	9700me	15205eu	15255va
1400	1500		USA, Voice of America 6160as 15255va 15425as	7125as	9645as	9760as	15160as	1500 1500	1600		USA, WBCQ Monticello ME USA, WEWN Birmingham AL	17494na 11875na			
1400 1400	1500 1500		USA, WBCQ Monticello ME USA, WEWN Birmingham AL	17494na 11875na				1500 1500	1600 1600		USA, WHRA Greenbush ME USA, WHRI Noblesville IN	17650af 13760va	15105am		
1400 1400	1500 1500		USA, WHRI Noblesville IN USA, WINB Red Lion PA 13750am	6040na	15105am			1500 1500	1600 1600		USA, WINB Red Lion PA 13570an USA, WJCR Upton KY 7490am	1 13595as			
1400 1400	1500	ntwhfa	USA, WJCR Upton KY 7490am USA, WRMI Miami FL 15724na	13595as				1500 1500	1600		USA, WRMI Miami FL USA, WRMI Miami FL 9955am				
1400 1400	1500 s 1500 s		USA, WRMI Miami FL 9955am USA, WRNO New Orleans LA	7305				1500 1500 1500	1600	•	USA, WRNO New Orleans LA USA, WTJC Newport NC 9370na	7395am	15420al		
1400	1500		USA, WTJC Newport NC 9370na	7395am	101/6	10045	15/05	1500	1600		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1400 1400	1500 1500		USA, WWCR Nashville TN USA, WWFV McCaysville GA	9475na 12172va		13845na		1500 1500	1600 1600		USA, WWFV McCaysville GA USA, WYFR Okeechobee FL	12172va 5280as	11830na	17750na	
1400	1500		USA, WYFR Okeechobee FL	11550as	11830na	11970na	17750na	1500	1600		Zambia, Christian Voice 4965do				

								П							
1500	1600	vl	Zambia, National BC Corp	6165do	6265do			1600	1700	mtwhfa	USA, WRMI Miami FL 15724na				
1500 1530	1600 1545	vl	Zimbabwe, Zimbabwe BC Corp Seychelles, FEBA Radio 11600as	5975do	6045do			1600 1600	1700 1700	S	USA, WRMI Miami FL 9955am USA, WRNO New Orleans LA	7395am	15420al		
1530 1530	1600 1600		Australia, Radio 5995va Austria, AWR Europe 7165eu	9475as 17660as	9580va	11650va	11660as	1600 1600	1700 1700		USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na	18910af			
1530	1600		Austria, R Austria International	6155eu	13730eu	17865na		1600	1700		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1530 1530	1600 1600	vl	Botswana, Radio 3356do Georgia, Georgian Radio	4820do 6180me	7255do			1600 1600	1700 1700		USA, WWFV McCaysville GA USA, WYFR Okeechobee FL	12172va 11830na	17750na	18980eu	21455eu
1530	1600		Iran, VOIRI 7245as 9635as	11775na							21525af	11000110	17730114	1070000	2140000
1530 1530	1600 1600	mtwhf	S Africa, World Beacon 6145af UK, BBC World Service 5975as	6190af	6195as	9740as	9815as	1600 1600	1700 1700	vl	Zambia, Christian Voice 4965do Zambia, National BC Corp	6165do	6265do		
			11940af 12095eu 15310as	15400af	15485eu	15565eu	17700as	1615	1630		Vatican City, Vatican Radio	4005eu	5885eu	7250eu	9645eu
1545	1600	smtw a	17830af 17840am 21470af Seychelles, FEBA Radio 11600as	21660af				1615	1700	as	15595eu UK, BBC World Service 11860af	21490af			
1550	1600		Vatican City, Vatican Radio	12065au	13765au	15235αυ		1625 1630	1640 1657		Armenia, Trans World Radio Vietnam, Voice of 9730eu	5855me 11630al	13740eu		
			4600					1630	1700	vl	Cameroon, CRTV Radio Buea	6005do	1374060		
			1600					1630 1630	1700 1700	s	Egypt, Radio Cairo 15255af Seychelles, FEBA Radio 11605as				
1600	1610		Vatican City, Vatican Radio	12065au	13765au	15235au		1630 1630	1700 1700	as	Slovakia, R Slovakia International UK BBC World Service 11860af	5920eu 21490af	6055eu	7345eu	
1600	1615		Pakistan, Radio 11570me	15100af	15725af	17720af		1630	1700	us	UK, BBC World Service 3915as	5975as	6109af	6195as	7160as
1600 1600	1625 1627		Netherlands, Radio 9890as Czech Rep, Radio Prague Intl	11835as 5930eu	12075as 21745af						9410eu 9740as 11940af 15485eu 15565eu 17700as	12095eu 17830af	15310as 17840am	15400af 21470af	15420af 21660af
1600 1600	1630 1630		Iran, VOIRI 7245as 9635as Israel, Kol Israel 15615va	11775as 17545va	21670va			1630	1700	f	UK, Merlin Network One 11535as				
1600	1630		Jordan, Radio 11690na	17680al				1630 1630	1700 1700	mtwh as	UK, Merlin Network One 11590as UK, Merlin Network One 11540as				
1600 1600	1630 1630		Mexico, R Mexico International S Africa, Channel Africa 9525af	9705am	11770am			1630 1645	1700 1700	vl	Zimbabwe, Zimbabwe BC Corp Germany, Deutsche Welle	4828do 6140eu	6045do		
1600	1630		UK, BBC World Service 3915as	5975as	6190af 15310as	6195as	7160as	1650	1700	mtwhf	New Zealand, R New Zealand Int	6095as			
			9410eu 9740as 11940af 15565eu 17700as 17830af	12095eu 17840am		15400af 21660af	15485eu								
1600 1600	1630 1640	vl	Zimbabwe, Zimbabwe BC Corp UAE, Radio Dubai 13630eu	5975do 13675eu	6045do 15395eu	21605eu					1700				
1600	1645		Germany, Deutsche Welle	6140eu	6170as	7225as	9735af	1700	1707			5020	01745 (		
1600	1650	occsnal	11665af 17595as 21840af New Zealand, R New Zealand Int	6095pa				1700 1700	1727 1727		Czech Rep, Radio Prague Intl Vietnam, Voice of 12070eu	5930eu	21745af		
1600 1600	1656 1700		North Korea, Voice of Korea Algeria, R Algiers International	3560va 11715va	6520va 15160va	9660va	9975va	1700 1700	1730 1730		Azerbaijan, Voice of 6110eu France R France International	9155eu 15605af	17605af		
1600	1700		Anguilla, Caribbean Beacon	11775am				1700	1730		Germany, Overcomer Ministries	6110eu	17 00301		
1600 1600	1700 1700	vl vl	Australia, ABC/Alice Springs Australia, ABC/Katherine	2310do 2485do				1700 1700	1730 1746		S Africa, Channel Africa 17870af UK, BBC World Service 3255af	3915as	5975as	6005af	6190af
1600	1700	vl	Australia, ABC/Tennant Creek	2325do	12705			""			6195eu 7160as 9410eu	9510as	9630af	9740as	12095eu
1600 1600	1700 1700		Australia, Christian Voice Australia, Radio 5995va	13730as 9475as	13795as 9580va	11650va	11660as	1700	1755		15400af 15420af 15485eu Poland, Radio Polonia 6000eu	15575me 7285eu	17830af	21470af	
1600 1600	1700 1700	vl	Botswana, Radio 3356do Canada, CBC Northern Service	4820do 9625do	7255do			1700 1700	1756 1800		Romania, R Romania Internationa Anguilla, Caribbean Beacon	l 11740eu 11775am	15365eu	15380eu	17805eu
1600	1700		Canada, CFRX Toronto ON	6070do				1700	1800	vl	Australia, ABC/Alice Springs	2310do			
1600 1600	1700 1700		Canada, CFVP Calgary AB Canada, CHNX Halifax, NS	6030do 6130do				1700 1700	1800 1800	vl vl	Australia, ABC/Katherine Australia, ABC/Tennant Creek	2485do 2325do			
1600 1600	1700 1700		Canada, CKZN St John's NF Canada, CKZU Vancouver BC	6160do 6160do				1700 1700	1800 1800		Australia, Christian Voice Australia, Radio 5995va	9720as 9475as	11890as 9580va	9655va	9815as
1600	1700		China China Radio International	7190af	13650af						11880va			7033Vd	701Jus
1600 1600	1700 1700		Costa Rica, R for Peace Intl Costa Rica, University Network	15049irr 5030am	21815usb	7375am	9724sa	1700 1700	1800 1800	vl	Botswana, Radio 3356do Canada, CBC Northern Service	4820do 9625do	7255do		
			11870am 13749na		01000	, 0, 0diii	772.00	1700	1800		Canada, CFRX Toronto ON	6070do			
1600 1600	1700 1700	a/monthly	Ethiopia, Radio 7165af Finland, Scandv Weekend Radio	9560af 11690va				1700 1700	1800 1800		Canada, CFVP Calgary AB Canada, CHNX Halifax, NS	6030do 6130do			
1600	1700		France R France International 17605af 17850af	11615af	11995af	12015af	15605af	1700 1700	1800 1800		Canada, CKZN St John's NF Canada, CKZU Vancouver BC	6160do 6160do			
1600	1700	а	Germany, Good News World R	15105af				1700	1800		China China Radio International	7150af	9570af	9670af	9695af
1600 1600	1700 1700	as vl	Germany, Overcomer Ministries Ghana, Ghana BC Corp	17490eu 4915do	6130do			1700	1800		11910af 15365af Costa Rica, R for Peace Intl	15049irr	21815usb		
1600	1700	a	Greece, Voice of 9420eu	15630eu	17705na			1700	1800		Costa Rica, University Network	5030am		7375am	9724sa
1600 1600	1700 1700		Guam, KSDA/ Adventist World R Guyana, Voice of 5949do	11850as				1700	1800		11870am 13749na 17645as Egypt, Radio Cairo 15255af				
1600 1600	1700 1700	vl	Kenya, Kenya BC Corp 4885irr Lesotho, Radio 4800do	4915irr				1700 1700	1800 1800	mtwhf a/monthly	Eqt Guinea, Radio Africa Finland, Scandv Weekend Radio	15185af 11690va			
1600	1700	vl	Liberia, ELWA 4760do					1700	1800	•	Germany, Deutsche Welle	6140eu			
1600 1600	1700 1700	vl	Liberia, R Liberia International Malaysia, Radio 7295do	6100do				1700 1700	1800 1800	a a	Germany, Good News World R Germany, Overcomer Ministries	11795me 17490eu			
1600	1700		Namibia, Namibian BC Corp	7165af	7215af			1700	1800		Germany, Voice of Hope 15750eu	12020.1	15405.5		
1600 1600	1700 1700	vļ	New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do					1700 1700	1800 1800	vl	Germany. Unt Methodist Church Ghana, Ghana BC Corp	13820af 3366do	15485af 4915do		
1600 1600	1700 1700	vl vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do		1700 1700	1800 1800	vl	Guyana, Voice of 5949do Italy, Italian Radio Relay Service	3985va			
1600	1700	vl	Nigeria, Radio/Lagos 3326do	4990do			15540	1700	1800		Japan, Radio 9505na	11970eu	15355af		
1600 1600	1700 1700		Russia, Voice of Russia WS S Africa, World Beacon 6145af	9875as	11985me		15540me	1700 1700	1800 1800		Kenya, Kenya BC Corp 4885irr Lesotho, Radio 4800do	4915irr			
1600 1600	1700 1700		South Korea, R Korea Intl Sri Lanka, Sri Lanka BC Corp	5975om 4940do	6150eu	9515af	9870af	1700 1700	1800 1800	vl vl	Liberia, ELWA 4760do Liberia, R Liberia International	6100do			
1600	1700		Taiwan, Radio Taipei International	11550as				1700	1800		Namibia, Namibian BC Corp	3270af	3289af		
1600 1600	1700 1700	а	Uganda, Radio 4976do UK, Merlin Network One 6175eu	5026do				1700 1700	1800 1800	mtwhf	New Zealand, R New Zealand Int New Zealand, ZLXA 3935do	6095as			
1600	1700	-	UK, World Beacon 15455eu	4070 -	4210	4002 -	E74E	1700	1800	vl	Nigeria, Radio/Enugu 6025do				
1600	1700		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va	1700 1700	1800 1800	vl vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do	
1600	1700		13254va 13362va 16847va USA, KAIJ Dallas TX 13815va					1700 1700	1800 1800	vl	Nigeria, Radio/Lagos 3326do Russia, Voice of Russia WS	4990do 7420eu	9480eu	9820eu11	675eu
1600	1700		USA, KTBN Salt Lake City UT	15590na				1700	1800	us	Russia, Voice of Russia WS	7420eu 9495af	9460eu 9685eu	9775eu	9890eu
1600 1600	1700 1700		USA, KWHR Naalehu Hl 9930as USA, VOA Special English	13600af	15445af	17895af		1700	1800		11510af 11985af S Africa, World Beacon 6145af				
1600	1700		USA, Voice of America 6035af	6160as	7125as	9645as	9700me	1700	1800		Sierra Leone, Sierra Leone BS	3316do			
1600	1700		9760as 13605af 13710af USA, WBCQ Monticello ME	15205eu 17494na	15225af	15255va	15410af	1700 1700	1800 1800	vl	Sri Lanka, Sri Lanka BC Corp Sudan, Radio Omdurman	3316irr 7199do	9200do	9505do	
1600	1700 1700		USA, WEWN Birmingham AL USA, WHRA Greenbush ME	11875na 17650af	13615na	15745eu		1700 1700	1800 1800		Uganda, Radio 4976do UK, Merlin Network One 11540as	5026do			
1600 1600	1700		USA, WHRI Noblesville IN	13760va	15105am			1700	1800	us	UK, World Beacon 15455eu				
1600 1600	1700 1700		USA, WINB Red Lion PA 13570am USA, WJCR Upton KY 7490am	13595as				1700	1800		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va
1600	1700		USA, WMLK Bethel PA 15265eu	. 20,003							13254va 13362va 16847va		,	5, , , ,	, /4

August 2001

1700	1800		USA, KAIJ Dallas TX 13815va					1800	1900	vļ	Lesotho, Radio 4800do				
1700 1700	1800 1800		USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI 9930as	15590na				1800 1800	1900 1900	vl vl	Liberia, ELWA 4760do Liberia, R Liberia International	5100do			
1700	1800		USA, Voice of America 6160as	7125as 15445af	7170as 17895af	9645as	9700me	1800	1900 1900		Namibia, Namibian BC Corp	3270af	3289af		
1700	1800	mtwhf	9760af 15255va 15410af USA, Voice of America 5990as	6045as	7215as	9550as	9770as	1800 1800	1900	vl	New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do				
1700	1800		9785as USA, WBCQ Monticello ME	17494na				1800 1800	1900 1900	vl vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do	
1700 1700	1800 1800		USA, WEWN Birmingham AL USA, WHRA Greenbush ME	11875na 17650af	13615na	15745eu		1800 1800	1900 1900	vl	Nigeria, Radio/Lagos 3326do	4990do			
1700	1800		USA, WHRI Noblesville IN	9495am	13760va			1800	1900		Philippines, Radyo Pilipinas Russia, Voice of Russia WS	11720pa 7300eu	15190pa 9480eu	17720pa 9495af	9685eu
1700 1700	1800 1800		USA, WINB Red Lion PA 13570am USA, WJCR Upton KY 7490am	13595as				1800	1900	m	9775eu 9890eu 11630eu S Africa, Amateur Radio League	11675eu 3215af	11695me	11980at	
1700 1700	1800 1800	mtwhf	USA, WMLK Bethel PA 15265eu USA, WRMI Miami FL 15724na					1800 1800	1900 1900	as	S Africa, Radio Lufonia 3345af S Africa, World Beacon 3230af	9675af	17665af		
1700	1800	IIIIWIII	USA, WRNO New Orleans LA	7395am	15420al			1800	1900		Sierra Leone, Sierra Leone BS	3316do	1700301		
1700 1700	1800 1800		USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na	18910af				1800 1800	1900 1900		Sri Lanka, Sri Lanka BC Corp Swaziland, Trans World Radio	3316irr 3200af	9500af		
1700 1700	1800 1800		USA, WWCR Nashville TN USA, WWFV McCaysville GA	9475na 12172va	12160na	13845na	15685na	1800 1800	1900 1900		Taiwan, Radio Taipei International Uganda, Radio 4976do	3955eu 5026do			
1700	1800		USA, WYFR Okeechobee FL	13855af	18980eu	21455eu		1800	1900		UK, World Beacon 15585af	17665af	4210	4002	E7/E
1700 1700		vl	Zambia, Christian Voice 4965do Zambia, National BC Corp	6165do	6265do			1800	1900		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va
1700 1725	1800 1740	vl	Zimbabwe, Zimbabwe BC Corp Germany, Trans World Radio	4828do 5855eu	6045do			1800	1900		13254va 13362va 16847va USA, KAIJ Dallas TX 13815va				
1725 1730	1745 1745	mtwhf vl	UK, United Nations Radio	6125af 15435af	15265me 17725af	17580af		1800 1800	1900 1900		USA, KJES Vado NM 15385au USA, KTBN Salt Lake City UT	15500			
1730	1745	as	Swaziland, Trans World Radio	9500af	1772301			1800	1900		USA, KWHR Naalehu HI 17510as	15590na			
1730 1730	1745 1800	mtwhf	Swaziland, Trans World Radio Belgium, RVI Flanders R Intl	3200af 5910eu	9925eu	13770eu		1800	1900		USA, Voice of America 6035af 15410af 15580af 17895af	7415af	9760af	9770me	11975af
1730 1730	1800 1800	mtwhf as	Georgia, Georgian Radio Georgia, Georgian Radio	6230eu 6080as				1800 1800	1900 1900	mtwhfa	USA, WBCQ Monticello ME USA, WEWN Birmingham AL	17494na 11875na	13615na	15745eu	
1730	1800	u3	Guam, KSDA/ Adventist World R	11965as	11/55 (			1800	1900		USA, WHRA Greenbush ME	17650af		137 1300	
1730 1730	1800 1800		Netherlands, Radio 6020af Philippines, Radyo Pilipinas	7120af 11720pa	11655af 15190pa	17720pa		1800 1800	1900 1900		USA, WHRI Noblesville IN USA, WINB Red Lion PA 13570am	9495am	13760va		
1730 1730	1800 1800	mtwhfa	S Africa, Adv World Radio Africa Sweden, Radio 6065va	12130af				1800 1800	1900 1900		USA, WJCR Upton KY 7490am USA, WMLK Bethel PA 15265eu	13595as			
1730 1730	1800 1800	S	Sweden, Radio 13580eu	15220af	17640af	21720af		1800 1800	1900 1900	mtwhf	USA, WRMI Miami FL 15724na USA, WRNO New Orleans LA	7205	15420al		
1730	1800		Switzerland, Swiss R International Vatican City, Vatican Radio	13765af	15570af	17515af		1800	1900		USA, WSHB Cypress Crk SC	7395am 15665va	18910af		
1735 1745	1745 1800	vl/th	Paraguay, Radio Nacional Bangladesh, Bangla Betar	9739sa 7185eu	9550eu	15520eu		1800 1800	1900 1900		USA, WTJC Newport NC 9370na USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1745	1800		India, All India Radio 7410eu 15155af 17670af	9950as	11935as	13750af	13790af	1800 1800	1900 1900		USA, WWFV McCaysville GA USA, WYFR Okeechobee FL	12172va 18980eu			
1745	1800	smtwhf	Swaziland, Trans World Radio	3200af	5075	(100 (	(105	1800	1900		Zambia, Christian Voice 4965do		(0/51		
1746	1800		UK, BBC World Service 3255af 7160as 9410eu 9510as	3915as 9740as	5975as 12095eu	6190af 15400af	6195eu 15420af	1800 1800	1900 1900	vl vl	Zambia, National BC Corp Zimbabwe, Zimbabwe BC Corp	6165do 4828do	6265do 6045do		
			15485eu 15575me 17830af	21470af				1805 1815	1810 1845	S	Croatia, The Voice of Croatia S Africa, Radio Lufonia 7155af	6165eu	13830eu		
								1830	1855						
			19NN								Greece, Voice of 11645eu	21420-4			
			1800					1830 1830	1900 1900		Ascension Island, RTE Radio Austria, R Austria International	21630af 5945eu	6155eu		
1800	1827		Vietnam, Voice of 7145eu	9730eu				1830	1900	vl	Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea		6155eu		
1800	1830	s	Vietnam, Voice of 7145eu Egypt, Radio Cairo 15255af	9730eu				1830 1830 1830 1830 1830	1900 1900 1900 1900 1900	vl	Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio 13640na Georgia, Georgian Radio	5945eu 6005do 11760eu		11655af	13700af
1800 1800 1800	1830 1830 1830	s	Vietnam, Voice of Egypt, Radio Cairo 15255af Germany, Universal Life 13855af Netherlands, Radio 6020af	7120af	11655af			1830 1830 1830 1830 1830 1830	1900 1900 1900 1900 1900 1900	vl	Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio 13640na Georgia, Georgian Radio Netherlands, Radio 6020af 17605af 21590af	5945eu 6005do 11760eu 7120af	9895af	11655af	13700af
1800 1800 1800 1800 1800	1830 1830 1830 1830 1830	s	Vietnam, Voice of 7145eu Egypt, Radio Cairo 15255af Germany, Universal Life 13855af Netherlands, Radio 6020af S Africa, Adv World Radio Africa S Africa, Channel Africa 17870af	7120af 5960af	6100af	(100	(105	1830 1830 1830 1830 1830 1830 1830	1900 1900 1900 1900 1900 1900 1900	vl	Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio 13640na Georgia, Georgian Radio Netherlands, Radio 6020af 17605af 21590af Slovakia, R Slovakia International Turkey, Voice of 9730as	5945eu 6005do 11760eu 7120af 5920eu 9785eu	9895af 6055eu	7345eu	
1800 1800 1800 1800	1830 1830 1830 1830	S	Vietnam, Voice of 7145eu Egypt, Radio Cairo 15255af Germany, Universal Life 1855af Netherlands, Radio 6020af S Africa, Adv World Radio Africa	7120af		6190eu 15575me	6195eu 17830af	1830 1830 1830 1830 1830 1830	1900 1900 1900 1900 1900 1900	vl	Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio 13640na Georgia, Georgian Radio Netherlands, Radio 6020af 17605af 21590af Slovakia, R Slovakia International Turkey, Voice of 9730as UK, BBC World Service 3255af	5945eu 6005do 11760eu 7120af 5920eu 9785eu 6005af	9895af 6055eu 6190af	7345eu 6195eu	9410eu
1800 1800 1800 1800 1800 1800	1830 1830 1830 1830 1830 1830		Vietnam, Voice of Egypt, Radio Cairo 15255af Germany, Universal Life 13855af Netherlands, Radio 6020af S Africa, Adv World Radio Africa S Africa, Channel Africa 17870af UK, BBC World Service 3255af 9410eu 9510as 12095eu 21470af	7120af 5960af 5975as	6100af 6190af			1830 1830 1830 1830 1830 1830 1830 1830	1900 1900 1900 1900 1900 1900 1900 1900	vl as	Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio 13640na Georgia, Georgian Radio Netherlands, Radio 6020af 17605af 21590af Slovakia, R Slovakia International Turkey, Voice of 9730as UK, BBC World Service 3255af 9630af 12095as 15400af USA, Voice of America 11690af	5945eu 6005do 11760eu 7120af 5920eu 9785eu	9895af 6055eu	7345eu	
1800 1800 1800 1800 1800 1800	1830 1830 1830 1830 1830 1830 1830	mtwh	Vietnam, Voice of Egypt, Radio Cairo 15255af Germany, Universal Life 13855af Netherlands, Radio 6020af S Africa, Adv World Radio Africa S Africa, Channen Africa 17870af UK, BBC World Service 9410eu 9510as 12095eu 21470af UK, Merlin Network One 11590as UK, Merlin Network One 11540as	7120af 5960af 5975as	6100af 6190af			1830 1830 1830 1830 1830 1830 1830 1830	1900 1900 1900 1900 1900 1900 1900 1900		Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio Georgia, Georgian Radio Netherlands, Radio 13640na 6020af 17605af 1590af Slovakia, R Slovakia International Turkey, Voice of UK, BBC World Service 9630af 12095as 15400af USA, Voice of America 11690af Vugoslavia, Radio 6100eu Congo, RTV Congolaise 4765do	5945eu 6005do 11760eu 7120af 5920eu 9785eu 6005af 15400af 13730af	9895af 6055eu 6190af 15575me 15525af	7345eu 6195eu	9410eu
1800 1800 1800 1800 1800 1800 1800 1800	1830 1830 1830 1830 1830 1830 1830 1830	mtwh f	Vietnam, Voice of Egypt, Radio Cairo 15255af Germany, Universal Life 13855af Netherlands, Radio Africa S Africa, Achannel Africa UK, BBC World Service 9410eu 9510as 21470af UK, Merlin Network One 11540as UK, Merlin Network One 115315as UK, RTE Radio 15315me	7120af 5960af 5975as 15400af	6100af 6190af			1830 1830 1830 1830 1830 1830 1830 1830	1900 1900 1900 1900 1900 1900 1900 1900		Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio 13640na Georgia, Georgian Radio Netherlands, Radio 6020af 17605af 21590af Slovakia, R Slovakia International Turkey, Voice of 9730as UK, BBC World Service 9630af 12095as 15400af USA, Voice of America 11690af Yugoslavia, Radio 6100eu	5945eu 6005do 11760eu 7120af 5920eu 9785eu 6005af 15400af	9895af 6055eu 6190af 15575me	7345eu 6195eu	9410eu
1800 1800 1800 1800 1800 1800 1800 1800	1830 1830 1830 1830 1830 1830 1830 1830	mtwh	Vietnam, Voice of Egypt, Radio Cairo 15255af Germany, Universal Life 13855af Netherlands, Radio 6020af S Africa, Adv World Radio Africa S Africa, Channel Africa 17870af UK, BBC World Service 9410eu 9510as 12095eu 21470af UK, Merlin Network One 11590as UK, Merlin Network One 11536as	7120af 5960af 5975as	6100af 6190af			1830 1830 1830 1830 1830 1830 1830 1830	1900 1900 1900 1900 1900 1900 1900 1900		Ascension Island, RTE Radio Austria, R Austria International Cameroon, CRTV Radio Buea Canada, RTE Radio 13640na Georgia, Georgian Radio Netherlands, Radio 6020af 17605af 21590af Slovakia, R Slovakia International Turkey, Voice of 9730as UK, BBC World Service 3255af 9630af 12095as 15400af USA, Voice of America 11690af Yugoslavia, Radio 6100eu Congo, RTV Congolaise 4765do Albania, R Tirana International New Zealand, R New Zealand Int	5945eu 6005do 11760eu 7120af 5920eu 9785eu 6005af 15400af 13730af	9895af 6055eu 6190af 15575me 15525af	7345eu 6195eu	9410eu
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190		2000		Costa Rica, University Network 11870am 13749na 17645as	5030am	6150am	7375am	9724sa	2000 2000	2045 2059		Iraq, Radio Iraq International Canada, R Canada International	7157irr 5995eu	9684irr 11690eu	11785irr 15325eu	17870eu
190 190 190	00	2000 2000 2000	mtwhf a/monthly	Ecuador, HCJB 17660eu Eqt Guinea, Radio Africa Finland, Scandv Weekend Radio	15185af 11690va				2000 2000	2100 2100		21570eu Algeria, R Algiers International Anguilla, Caribbean Beacon	11715eu 11775am	11750eu	15160va	
190	00	2000 2000 2000	vl	Germany, Voice of Hope 7290eu Ghana, Ghana BC Corp	15750as 3366do	4915do			2000 2000 2000	2100 2100 2100	vl vl	Australia, ABC/Alice Springs Australia, ABC/Katherine	2310do 2485do			
190	00	2000 2000	vl	Italy, Italian Radio Relay Service Kenya, Kenya BC Corp 4885irr	3985va 4915irr	.,			2000 2000	2100 2100	vl	Australia, ABC/Tennant Creek Australia, Radio 9500as	2325do 9580va	9815pa	11880va	12080va
190	00	2000	vl	Kuwait, Radio 11990va Lesotho, Radio 4800do	.,				2000 2000	2100 2100	νl	Botswana, Radio 3356do Canada, CBC Northern Service	4820do 9625do	,		
190 190	00	2000 2000	vl vl	Liberia, ELWA 4760do Liberia, R Liberia International	5100do				2000 2000	2100 2100		Canada, CFRX Toronto ON Canada, CFVP Calgary AB	6070do 6030do			
190 190	00	2000 2000	asmtwh	Malta, Voice of Mediterranean Namibia, Namibian BC Corp	12060eu 3270af	3289af			2000 2000	2100 2100		Canada, CHNX Halifax, NS Canada, CKZN St John's NF	6130do 6160do			
190		2000		Netherlands, Radio 6020af 17605af 21590af	7120af	9895af	11655af	13700af	2000 2000	2100 2100		Canada, CKZU Vancouver BC China China Radio International	6160do 5965eu	9440af	9840eu	11735af
190 190	00	2000	vl	New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do					2000	2100		13640af Costa Rica, R for Peace Intl		21815usb	7075	0704
190 190	00	2000	vl vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do		2000	2100	ا مار روس	Costa Rica, University Network 11870am 13749na 17645as		6150am	7375am	9724sa
190 190	00	2000	vl	Nigeria, Radio/Lagos 3326do Nigeria, Voice of 7255af	4990do 11770af	15120na	0775	0000-	2000 2000 2000	2100 2100 2100	mtwhf a/monthly	Eqt Guinea, Radio Africa Finland, Scandv Weekend Radio Germany, Voice of Hope 7290eu	15185af 11720va 15750as			
190		2000		Russia, Voice of Russia WS 11675eu 12070eu Russia, World Beacon 7360eu	9480eu	9685eu	9775eu	9890eu	2000 2000 2000	2100 2100 2100	vl	Ghana, Ghana BC Corp Indonesia, Voice of 9525eu	3366do 11784eu	4915do 15149eu		
190	00	2000 2000 2000		Russia, World Beacon 7360eu S Africa, World Beacon 3230af Sierra Leone, Sierra Leone BS	9675af 3316do	11640af			2000 2000 2000	2100 2100 2100	vl	Italy, Italian Radio Relay Service Kenya, Kenya BC Corp 4885irr	3985va 4915irr	1314760		
190	00		vl	Solomon Islands, SIBC 5020do South Korea, R Korea Intl	5975	om	7275eu		2000 2000	2100 2100	vl	Kuwait, Radio 11990va Lesotho, Radio 4800do	1710111			
190 190	00	2000	а	Sri Lanka, Sri Lanka BC Corp Sri Lanka, Sri Lanka BC Corp	3316irr 6010eu				2000 2000	2100 2100	vl vl	Liberia, ELWA 4760do Liberia, R Liberia International	5100do			
190 190		2000 2000		Swaziland, Trans World Radio Thailand, Radio 7155eu	3200af 9655eu	11905eu			2000 2000	2100 2100		Namibia, Namibian BC Corp New Zealand, R New Zealand Int	3270af 15160pa	3289af		
190 190		2000 2000		Uganda, Radio 4976do UK, BBC World Service 3255af	5026do 6005af	6190af	6195eu	9410eu	2000	2100	vl	New Zealand, ZLXA 3935do Nigeria, Radio/Enugu 6025do	7290do			
190		2000		9630af 12095eu 12095eu UK, World Beacon 9675eu	15400af 15585eu	15575me	17830af	57/5	2000	2100 2100 2100	vl vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do	6090do	7275do	9570do	
190	)()	2000		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va	2000 2000 2000	2100 2100 2100	vl l	Nigeria, Radio/Lagos 3326do Nigeria, Voice of 7255af Papua New Guinea, NBC	4990do 11770af	15120na		
190 190		2000 2000		13254va 13362va 16847va USA, KAIJ Dallas TX 13815va USA, KTBN Salt Lake City UT	15590na				2000	2100	vl	Russia, Voice of Russia WS 12070eu 15455eu	4890do 9480eu	9775eu	9890eu	11675eu
190	00	2000 2000 2000		USA, KWHR Naalehu HI 17510as USA, VOA Special English	7260eu	9680me	13690me		2000 2000	2100 2100		Russia, World Beacon 7360eu S Africa, World Beacon 3230af	9675af	11640af	15465eu	
190		2000		USA, Voice of America 4950af 9525pa 9760af 9770af	6035af 11805pa	6160me 11975af	7375af	7415af 15410af	2000 2000	2100 2100	vl mtwhf	Solomon Islands, SIBC 5020do Spain, R Exterior Espana 9595af	15290eu		10 10000	
190	00	2000	mtwhf	15445af 15580af USA, Voice of America 9550eu	9840as		11780me		2000 2000	2100 2100	vl	Sri Lanka, Sri Lanka BC Corp Syria, Radio Damascus 12085eu	4940irr 13610eu			
190			mtwhfa	12015as 13725me 15235as USA, WBCQ Monticello ME	17494na				2000 2000	2100 2100		Uganda, Radio 4976do UK, BBC World Service 3255af	5026do 6005af	6190af	6195eu	9410eu
190 190	00	2000 2000		USA, WEWN Birmingham AL USA, WHRA Greenbush ME	11875na 17650af	13615na	15745eu		2000	2100		9630af 11835af 12095eu UK, World Beacon 7420af	15400af 9675af	17830af	1000	57/5
190 190	00	2000		USA, WHRI Noblesville IN USA, WINB Red Lion PA 13570am	9495am	13760va			2000	2100		USA, Armed Forces Radio 6350va 6458va 6847va	4278va 10320va	4319va 10940va	4993va 12579va	5765va 12689va
190 190 190	00	2000 2000 2000	mtwhf	USA, WJCR Upton KY 7490am USA, WMLK Bethel PA 15265eu USA, WRMI Miami FL 15724na	13595as				2000 2000	2100 2100		13254va 13362va 16847va USA, KAIJ Dallas TX 13815va USA, KJES Vado NM 15385na				
190	00	2000 2000 2000	IIIIWIII	USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC	7395am 15665va	15420al 18910af			2000 2000	2100 2100		USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI 17510as	15590na			
190	00	2000 2000		USA, WTJC Newport NC 9370na USA, WWCR Nashville TN	9475na	12160na	13845na	15685na	2000 2000	2100 2100	mtwhfa	USA, WBCQ Monticello ME USA, WBCQ Monticello ME	7415na 17494na			
190 190		2000 2000		USA, WWFV McCaysville GA USA, WYFR Okeechobee FL	12172va 15775af	18980eu			2000 2000	2100 2100		USA, WEWN Birmingham AL USA, WHRA Greenbush ME	11875na 17650af	13615na	15745eu	
190 190	00		vl	Zambia, Christian Voice 4965do Zambia, National BC Corp	6165do	6265do			2000 2000	2100 2100		USA, WHRI Noblesville IN USA, WINB Red Lion PA 13570am	5745va	9495am		
190 193	30	1945	vl f	Zimbabwe, Zimbabwe BC Corp Congo, RTV Congolaise 4765do	4828do	6045do			2000	2100 2100	. 16	USA, WJCR Upton KY 7490am USA, WMLK Bethel PA 15265eu	13595as			
193 193	30	2000	t h	Belarus, R Belarus International Belgium, RVI Flanders R Intl	7105eu 9925eu	7210eu			2000	2100 2100 2100	smtwhf	USA, WRMI Miami FL 15724na USA, WRNO New Orleans LA USA, WTJC Newport NC 9370na	7395am	15420al		
193 193 193	30	2000 2000 2000	vl	Iran, VOIRI 9022eu 11670eu Papua New Guinea, NBC Poland, Radio Polonia 6035eu	13730eu 4890do 7185eu	7265eu	9525eu		2000 2000 2000	2100 2100 2100		USA, WWCR Nashville TN USA, WWFV McCaysville GA	9475na 12172va	12160na	13845na	15685na
193	30	2000 2000 2000		Sweden, Radio 6065eu Switzerland, Swiss R International	13770af	15220af	17580af	17735af	2000 2000	2100 2100	vl	USA, WYFR Okeechobee FL Vanuatu, Radio 3945do	17845af 4960do	18980eu 7260do		
193	35	1955	mtwhfa	Italy, RAI International 5970eu Armenia, Voice of 4810eu	9750eu 9960eu	1022001	1700001	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2000 2000	2100 2100	vl	Zambia, Christian Voice 4965do Zambia, National BC Corp	6165do	6265do		
195 195		1950 2000		Vatican City, Vatican Radio New Zealand, R New Zealand Int	4005eu 15160pa	5885eu	7250eu	9645eu	2000 2000	2100 2100	vl	Zimbabwe, Zimbabwe BC Corp USA, WSHB Cypress Crk SC	4828do 15665va	6045do 18910af		
_				2000					2010	2030		Vatican City, Vatican Radio Italy, RAI International 7125af	9660af 9635af	11625af 11880af	13765af	
_				2000					2030 2030 2030	2045 2045 2057	vl	Libya, Voice of Africa 11815af Thailand, Radio 9655eu Vietnam, Voice of 9730eu	15435af 9680eu	17725af 11905eu		
200	00	2010		Vatican City, Vatican Radio 9660af 11625af 13765af	4005eu	5885eu	7250eu	9645eu	2030 2030 2030	2100 2100	th	Australia, Christian Voice Belarus, R Belarus International	11630al 9720as 7105eu	13740eu 9865va 7210eu	11840va	
200 200		2015 2025		Swaziland, Trans World Radio Netherlands, Radio 6020af	3200af 7120af	9895af	11655af	13700af	2030 2030 2030	2100 2100 2100		Cuba, Radio Havana 13660eu Ecuador, HCJB 17660eu	13750eu 21455usb			
200	00	2025		17605af 21590af Poland, Radio Polonia 6035eu	7185eu	7265eu	9525eu		2030 2030	2100 2100		Egypt, Radio Cairo 15375af S Africa, Adv World Radio Africa	9745af			
200	00	2027		Czech Rep, Radio Prague Intl Australia, Christian Voice	5930eu 9720as	11600au			2030 2030	2100 2100	f	Turkey, Voice of 7170as UK, Wales Radio Intl/Merlin	7325eu			
200	00	2030		Ecuador, HCJB 17660eu Iran, VOIRI 9022eu 11670eu	13730eu							USA, Voice of America 6035af 9770af 11975af 15410af	6095me 15445af	7375af 15580af	7415af 17745af	9760af 17895af
200 200		2030 2030		Mongolia, Voice of 12015eu Switzerland, Swiss R International 13790af	12085eu 13770af	15220af	17580af	13660af	2030	2100	as	USA, Voice of America 4950af Uzbekistan, Radio Tashkent	9540eu	9545eu	0010	0050
200	00	2030		USA, Voice of America 4950af 9760as 9770af 11855af	6035af 11975af	6095af 15410af	7375af 15445af	7415af 15580af	2045	2100		India, All India Radio 7150au 11620au 11715au	7410eu	9650eu	9910au	9950eu
200	00	2045		17745af 17895af Germany, Deutsche Welle	7130eu	1071001	IJUTTJUI	10000UI								
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	2100		2130 2200 vl Australia, ABC/Alice Springs 4835do 2130 2200 vl Australia, ABC/Katherine 5025do
2100 2110	Kenya, Kenya BC Corp 4885irr 4915irr		2130         2200         V         Australia, ABC/Tennant Creek         4910do         4910do
2100 2115 2100 2130 vl 2100 2130 vl 2100 2130 vl 2100 2130	Egypt, Radio Cairo         15375af           Australia, ABC/Alice Springs         2310do           Australia, ABC/Katherine         2485do           Australia, ABC/Tennant Creek         2325do           Australia, Christian Voice         9865pa         11840va         21550	0	2130   2200 mtwhf   Austrio, R Austrio International   5945eu   6155eu
2100 2130 2100 2130 2100 2130	Australia, Radio 7240va 9500as 9580va 9660p 12080va 17715va 21740va Austria, AWR Europe 15165af China China Radio International 5965eu 9840eu 11735	11880va	2130     2200     South Korea, R Korea Intl     15575eu       2130     2200     Sweden, Radio     6065eu     15255as       2130     2200     UK, BBC World Service     3255af     3915as     5965as     5975am     6005af       6190af     6190af     6195va     9410eu     11835af     11945as     12095sa     15400af
2100 2130 2100 2130 2100 2130 2100 2130	Cuba, Radio Havana     13660eu     13750eu       South Korea, R Korea Intl     3975eu     15575eu       Turkey, Voice of     7170as       UK, BBC World Service     3255af     3915as     5965as     6005a	6190af	2130         2200         Uzbekistan, Radio Tashkent         7105eu         9540eu           2145         2200         USA, WYFR Okeechobee FL         13855af         15120af         17845af
2100 2130 as	6195va 9410eu 11835af 11945as 12095sa 15400 UK, BBc World Service 5975am 3915as		2200
2100 2130 2100 2145	Yugoslavia, Radio 6100eu Germany, Deutsche Welle 9670pa 9765pa 9875a 11915pa 15135af	11865af	2200 2210 vl Zambia, National BC Corp 6165do 6265do 2200 2215 New Zealand, R New Zealand Int 15160pa
2100 2145 2100 2156 2100 2200 2100 2200 2100 2200 vl 2100 2200 2100 2200 2100 2200	USA, WYFR Okeechobee FL   13855df   15120df   17845   Romania, R Romania International 9725eu   11740eu   11940eu   11940eu   11940eu   11940eu   11940eu   11940eu   11975am   11975am		2200         220 s         Greece, Voice of 9425au 15650au         15650au           2200         2225 ltaly, RAI International 9675as 11900as 15265as         13670am 17695am           2200         2230 mtwhf 2230 Canada, R Canada International 15305am 17880am         17880am 17695am           2200         2230 lndia, All India Radio 7150au 11765au         7410eu 9650eu 9910au 9950eu           2200         2230 lndia, All India Radio 7150au 17175au         7410eu 9650eu 9910au 9950eu           2200         2230 lran, VOIRI 9570as 13745as
2100 2200 2100 2200 2100 2200 2100 2200 2100 2200	Canada, CFVP Calgary AB 6030do Canada, CHNX Halifax, NS 6130do Canada, CKZN St John's NF 6160do Canada, CKZU Vancouver BC 6160do Costa Rica, R for Peace Intl 15049irr 21815usb		2200         2230         Mexico, R Mexico International         9705am         11770am           2200         2230         vl         Papua New Guinea, NBC         4890do           2200         2230         mtwhf         USA, Voice of America         5855af         6035af         7375af         7415af         11975af           2200         2230         mtwhfa         Yugoslavia, Radio         7230au           2200         2245         Egypt, Radio Cairo         9990eu
2100 2200 2100 2200 2100 2200 mtwhf 2100 2200 f/monthly	Costa Rica, University Network 11870am 13749na 17645as Ecuador, HCJB 17660au 21455usb Eqt Guinea, Radio Africa 15185af Finland, Scandy Weekend Radio 11720va 7375a	n 9724sa	2200         2245         USA, WYFR Okeechobee FL         11740na         15120af         17845af           2200         2300         Anguilla, Caribbean Beacon         6090am           2200         2300         VI         Australia, ABC/Alice Springs         4835do           2200         2300         VI         Australia, ABC/Katherine         5025do           2200         2300         VI         Australia, ABC/Tennant Creek         4910do
2100 2200 vl 2100 2200 vl 2100 2200 vl 2100 2200	Ghana, Ghana BC Corp       3366do       4915do         India, All India Radio       7150au       7410eu       9650eu       9910a         11620au 11715au       11610a Radio Relay Service       3985va       3985va       6055eu       6180eu       11830		2200         2300         Australia, Christian Voice         9865pa         17850va         21550va           2200         2300         Australia, Radio         11880as         15240as         17715va         17795va         21740va           2200         2300         Canada, CEC Northerm Service         9625do         9625do         2000         2000         Canada, CFRX Toronto ON         6070do         6070do         6070do         6030do         7000         700
2100 2200 vl 2100 2200 vl 2100 2200 vl 2100 2200 2100 2200 2100 2200	17825na 17860pa 21670pa Lesotho, Radio 4800do Liberia, ELWA 4760do Liberia, R Liberia International 5100do Namibia, Namibian BC Corp 3270af 3289af New Zealand, R New Zealand Int 15160pa New Zealand, ZIXA 3935do 7290do		2200         2300         Canada, CHNX Halifax, NS         6130do           2200         2300         Canada, CKZN St John's NF         6160do           2200         2300         Canada, CKZU Vancouver BC         6160do           2200         2300         China China Radio International         7170eu           2200         2300         Costa Rica, R for Peace Intl         15049irr         21815usb           2200         2300         Costa Rica, University Network         5030am         6150am         7375am         9724sa
2100 2200 vl 2100 2200 vl 2100 2200 vl 2100 2200 vl 2100 2200 vl 2100 2200 vl 2100 2200 vl	Nigeria, Radio/Enugu         6025do           Nigeria, Radio/Ibadan         6050do           Nigeria, Radio/Kaduna         4770do           Nigeria, Radio/Lagos         3326do           Nigeria, Voice of         7255af           Papua New Guinea, NBC         4890do           Russia, World Beacon         7360eu	,	2200   2300   mtwhf   Eqt Guinea, Radio Africa   15185af
2100 2200 vl 2100 2200 vl 2100 2200 as 2100 2200 vl 2100 2200 vl 2100 2200 2100 2200	S Africa, World Beacon       3230df       9675df       11640af         Solomon Islands, SIBC       5020do       9545do       5945do         Spain, R Exterior Espana 9595af       9840eu         Sri Lanka, Sri Lanka BC Corp       4940irr         Syria, Radio Damascus       12085eu         UK, World Beacon       9675af         Ukraine, R Ukraine, International       5905eu       7410eu         11705	u 11950eu	2200         2300         New Zealand, ZIVA         3935do         7290do           2200         2300         vl         Nigeria, Radio/Ibadan         6050do           2200         2300         vl         Nigeria, Radio/Kaduna         4770do         6090do         7275do         9570do           2200         2300         vl         Nigeria, Radio/Lagos         3326do         4990do         7255af         11770af         15120na           2200         2300         vl         Solomon Islands, SIBC         5020do         9545do
2100 2200	12040na USA, Armed Forces Radio 4278va 4319va 4993w 6350va 6458va 6847va 10320va 10940va 12579 13254va 13362va 16847va	5765va	2200         2300         Sri Lanka, Sri Lanka BC Corp         4940irr           2200         2300         Taiwan, Radio Taipei International 11565eu         15600eu           2200         2300         Turkey, Voice of 7190va         11845va           2200         2300         UK, BBC World Service         5965as         5975am         6195na         7105as         9660as
2100 2200 2100 2200 2100 2200 2100 2200	15294va 1054Va 10647va USA, KAII Dallas TX 13815va USA, KTBN Salt Lake City UT 15590na USA, KWHR Naalehu HI 17510as USA, Voice of America 6035af 6040me 6095me 7375a	7415as	2200 2300 USA, Armed Forces Radio 4278va 4319va 4993va 5765va 6350va 6458va 6847va 10320va 10940va 12579va 12689va 13254va 13362va 16847va
2100 2200 2100 2200 mtwhf 2100 2200	9530af 9705as 9760eu 11870pa 11975af 15185 15445af 15580af 17740as 17820as 17895af USA, WBCQ Monticello ME 9330na USA, WECQ Monticello ME 9330na 15745		2200     2300     USA, KAIJ Dallas TX     13815va       2200     2300     USA, KTBN Salt Lake City UT     15590na       2200     2300     USA, KWHR Naalehu HI     17510as       2200     2300     USA, Voice of America     7215as     9705as     9770as     11760as     15185as       15290as     15305as     177740as     17820as       2000     2300     17820as     17820as
2100 2200 2100 2200 2100 2200 2100 2200 2100 2200 2100 2200 2100 2200 2100 2200	USA, WHRI Nobelsville IIN 5745va 9495am USA, WHRI Noblesville IN 5745va 9495am USA, WISA Red Lion PA 13570am USA, WJCR Upton KY 7490am USA, WRM Miami FL 15724na USA, WRNO New Orleans LA 7395am 15420al USA, WSHB Cypress Crk SC 15665va 18910af		2200     2300     USA, WBCQ Monticello ME     7415na       2200     2300     mtwhf     USA, WBCQ Monticello ME     9330na       2200     2300     a     USA, WBCQ Monticello ME     17494na       2200     2300     USA, WEWN Birmingham AL     9385na     9975eu     13615na       2200     2300     USA, WHRA Greenbush ME     7580eu       2200     2300     USA, WHRI Noblesville IN     5745va     9495am       2200     2300     USA, WINB Red Lion PA     13570am
2100 2200 2100 2200 2100 2200 2100 2200 a 2100 2200 vl	USA, WTJC Newport NC 9370na USA, WWCR Nashville TN 9475na 12160na 13845 USA, WWFV McCaysville GA 12172va USA WBCQ Monticello ME 17494na Vanuatu, Radio 3945do 4960do 7260do	a 15685na	2200     2300     USA, WJCR Upton KY     7490am     13595as       2200     2300     as     USA, WRMI Micrari FL     9955am       2200     2300     USA, WRNO New Orleans LA     7395am     15420al       2200     2300     USA, WSHB Cypress Crk SC     13770eu     15285sa       2200     2300     USA, WTLC Newport NC     9370na       2300     2300     USA, WGCP Nezbuilla TN     7435aa     9475aa     12160aa     13845aa
2100 2200 vl 2100 2200 vl 2100 2200 vl 2115 2130 mtwhf 2115 2200	Zambia, Christian Voice4965do         2ambia, Christian Voice4965do           Zambia, National BC Corp         6165do         6265do           Zimbabwe, Zimbabwe BC Corp         4828do         6045do           UK, BBC Caribbean Report         5975ca         11675ca         15390           Egypt, Radio Cairo         9990eu         15375af         15465ca         15390	a	2200         2300         USA, WWCR Nashville TN         7435na         9475na         12160na         13845na           2200         2300         USA, WWFV McCaysville GA         5085va         12172va         12172va           2200         2300 vl         Vanuatu, Radio         3945da         4960da         7260da           2200         2300         Zambia, Christian Voice 4965da         17675pa         17675pa           2300         Rew Zealand, R. New Zealand Int         11100a         16445a
2120 2200 s 2130 2145 tf 2130 2157 2130 2200	Greece, Voice of 9425au 15650au UK, BBC Calling Falklands 11680sa Czech Rep, Radio Prague Intl Albania, R Tirana International 7130eu 9540eu		2230         2257         Czech Rep, Radio Prague Intl         11600na         15445na           2230         2300         Belgium, RVI Flanders R Intl         15565na         15565na           2230         2300         Canada, R Canada International         9755am         13670am         17695am           2230         2300         Cuba, Radio Havana         9550am         9755am         13670am         17695am

# **PROGRAMMING**

# **Shortwave Guide**

2230	2300	vl	Papua New Guinea, NBC	4890do	11880irr	
2230	2300	vl/as	Solomon Islands, SIBC 5020do			
2230	2300	vl/a	Solomon Islands, SIBC 9545do			
2245	2300		India, All India Radio 9705as	9950as	11620as	13605as
2245	2300		USA, WYFR Okeechobee FL	11740na		

### 2300

	2300				
2300 0300 sm f 2300 0000 vl 2300 0000 2300 0000 2300 0000 2300 0000 2300 0000 2300 0000	USA, WINB Red Lion PA 12160am Anguilla, Caribbean Beacon Australia, ABC/Alice Springs Australia, ABC/Katherine Australia, ABC/Tennant Creek Australia, Christian Voice Bulgaria, Radio 9400na Cameroon, CRTV Radio Buea Canada, CBC Northern Service Canada, CFXR Toronto ON Canada, CFVP Calgary AB Canada, CRTV St John's NF Canada, CKZN St John's NF Canada, CKZN St John's NF Canada, CKZV St John's NF CANADA ST JOHN'S NF C	6090am 4835do 5025do 4910do 9865pa 11700na 6005do 9625do 6070do 6030do 6130do 6160do 6160do	17850va	21550va	
2300 0000 2300 0000 2300 0000	China China Radio International Costa Rica, R for Peace Intl Costa Rica, University Network 11870am 13749na 17645as Ecuador, HCJB 17660as	5990na 15049irr 5030am	21815usb 6150am	7375am	9925sa
2300 0000 2300 0000 f/monthly 2300 0000 vl 2300 0000 vl 2300 0000 vl	Egypt, Radio Cairo 9900am Finland, Scandv Weekend Radio Ghana, Ghana BC Corp India, All India Radio 9705as Liberia, R Liberia International Malaysia, Radio 7295do	11690va 3366do 9950as 5100do	4915do 11620as	13605as	
2300 0000 2300 0000 2300 0000 2300 0000 2300 0000 vl 2300 0000	Malaysia, RTM Kota Kinabalu Namibia, Namibian BC Corp New Zealand, R New Zealand Int New Zealand, ZLXA 3935do Papua New Guinea, NBC Singapore, SBC Radio One	5980do 3270af 17675pa 7290do 4890do 6150do	3289af 11880irr		
2300 0000 vl/as 2300 0000 vl/a 2300 0000 2300 0000	Solomon Islands, SIBC 5020do Solomon Islands, SIBC 9545do Sri Lanka, Sri Lanka BC Corp UK, BBC World Service 3915as 7105as 11945as 11955as	4940do 5965as 12095sa	5975am 15280as	6035as	6195as
2300 0000 2300 0000 2300 0000	USA, Armed Forces Radio 6350va 6458va 6847va 13254va 13362va 16847va USA, KAU Dallas TX 13815va USA, KTBN Salt Lake City UT	4278va 10320va 15590na	4319va 10940va	4993va 12579va	5765va 12689va
2300 0000 2300 0000	USA, KWHR Naalehu HI 17510as USA, VOA Special English	7190as	7200as	9545as	11805pa
2300 0000 2300 0000 2300 0000 mtwhf 2300 0000 a	11925as 13735as 13775as USA, Voice of America 7215as 15290as 15305as 17740as USA, WBCQ Monticello ME USA, WBCQ Monticello ME USA, WBCQ Monticello ME	15205pa 9705as 17820as 7415na 9330na 17494na	9770as	11760as	15185as
2300 0000 2300 0000 2300 0000 2300 0000 2300 0000 2300 0000	USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA 13570am USA, WICR Upton KY 7490am USA, WIRM Miami FL 9955am	9385na 7580eu 5745va	9975eu 9495am	13615na	
2300 0000 2300 0000 2300 0000 2300 0000 as	USA, WRNO New Orleans LA USA, WSHB Cypress Crk SC USA, WTJC Newport NC 9370na USA, WWBS Macon GA 11910na	7355va 13770eu	15285sa		
2300 0000 2300 0000 2300 0000 vl 2300 0000 2300 2305 vl 2300 2305 vl	USA, WWCR Nashville TN USA, WWFV McCaysville GA Vanuatu, Radio 3945do Zambia, Christian Voice 4965do Nigeria, Radio/Enugu 6025do Nigeria, Radio/Enugu 6050do	7435na 5085va 4960do	9475na 6890va 7260do	12160na	13845na
2300 2305 vl 2300 2305 vl	Nigeria, Radio/Ibadan 6050do Nigeria, Radio/Kaduna 4770do Nigeria, Radio/Lagos 3326do	6090do 4990do	7275do	9570do	
2300 2330	Australia, Radio 9660pa 17795va 21740va	11880as	12080va	15240as	17715va
2300 2330 mtwhf 2300 2330	Canada, R Canada International Cuba, Radio Havana 9550am	6040am	11865am	15305am	
2300 2330 mtwhf 2300 2345 2300 2345 2300 2356	Mexico, R Mexico International Germany, Deutsche Welle USA, WYFR Okeechobee FL Romania, R Romania International	9705am 9815as 11740na 9750eu	11770am 12055as 11775eu	13610as 11940na	21790as 15105na
2300 2359 2330 0000 2330 0000	Canada, R Canada International Australia, Radio 9660pa 17715va 17795va 21740va Malaysia, RTM Sarawak 7160do	9755am 11695as	13670am 12080va	17695am 15240as	15415as
2330 0000 2330 0000 2330 0100	Netherlands, Radio 6165na Switzerland, Swiss R International Lithuania, Radio Vilnius 9875na	9845na 9885sa	11905sa		
2330 2345 vl 2330 2357	Libya, Voice of Africa 11815af Vietnam, Voice of 12019as	15435af 15115as	17725af		

[BBCWS stream abbreviations: (am) = Americas; (eu) = Europe/N. Africa; (me) = Middle East, SW Asia, CIS (former Soviet Union); (wcat) = West and Central Africa; (esaf) = East and Southern Africa; (af) = both (wcaf) and (esaf); (sas) = South Asia; (eas) = East Asia.]

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	R. Netherlands	Α	A Good Life (develop-		ledia and Com
0028	HCJB	T-A	ment issues) Money Minute	0000	WBCQ(7415)
0020	R. Prague	F	Economic Report	0047	Spanish Foreig
0030	R. Netherlands	W	A Good Life (develop- ment issues)	Listene	r Contact/Inter
_			<i>'</i>	0005	R. Australia
	/Technology (incl. He R. Netherlands	ealth & E	nvironment) The Research File		R. Japan R. Prague
0010	R. Australia	T	The Science Show	0030	HCJB
	R. Netherlands VOA News Now	F W	The Research File Our World	0035 0047	Spanish Foreig Spanish Foreig
		"	OUI WORLD	0047	Spanish Foloig
Arts &	<b>Culture</b> R. Netherlands	S	Aural Tapestry	Sport 0018	VOA News Nov
	BBCWS(am)	W	Meridian-Screen (cin-		BBCWS(am)
		F	ema)		)100 UT
		Г	Meridian-Writing (books)		sts (*extended
	R. Prague	S	Readings from Czech	0100	BBCWS(am)
0010	R. Australia	M	Literature Awaye! (Aboriginal		China R. Int.
	D D		culture)		Deutsche Wel
0030	R. Prague BBCWS(am)	M S	The Arts Arts in Action		HCJB
	R. Netherlands	S	Roughly Speaking		R. Australia
		M	(youth culture) Aural Tapestry		R. Budapest R. Canada Int.
0033	VOA News Now	Н	Kaleidoscope		R. Habana Cul
local I	ives and Views				R. Netherland R. New Zealar
	R. Netherlands	M	Dutch Horizons		R. Prague
		F	Talking It Over (in- terviews)		Spanish Foreig VOA News Nov
0005	R. Prague	M	Letter from Prague		Voice of Russia
0010	R. Australia	T-A F	Current Affairs Hindsight (Australian	0110	Voice of Vietn R. Habana Cul
0010	K. Ausiluliu	'	history)	0110	VOA News No
	R. Japan R. New Zealand Int.	M S	Weekend Square This Week in Parlia-	0114 0130	
	K. New Zealand IIII.	3	ment	0130	R. Habana Cul RTE, Ireland
0015	D D	A	Focus on Politics		VOA News No
0015	R. Prague	T	Spotlight (Czech cur- rent events) or		VOA Spec. Eng Voice of Russia
			One on One (inter-		
		Н	view) Czechs in History or		Affairs Magaz R. Netherland
			Central Europe Today	0105	
0020 0030	R. Prague R. Australia	M A	From the Weeklies In Conversation-Rural		
5550	R. Netherlands	Ī	Euroquest (Europe in		R. Australia
		Н	context) Dutch Horizons	0110	R. Australia R. Australia
	R. New Zealand Int.	S	Spectrum (life in NZ)	0110	R. Habana Cul
Inform	ntional Features		·		R. Netherland
	R. Netherlands	Н	Documentary	0110	China R. Int.
0005	R. Australia	S	The Europeans		
0022	VOA Noue Nou	ТА	Eastura stony		

af)=	= both (w	caf) and (esaf); <b>(sas)</b> =	= South A	sia; <b>(eas)</b> = East Asia.]
	0020	D. Nashardanda	_	D
	0030 0047	R. Netherlands Spanish Foreign R.	F T-A	Documentary Spanish Language
				Course
	Music 0000	R. Netherlands	W	Music 52-15 (world/
		WBCQ(7415kHz)	S	folk) Different Kind of Old-
			M	ies Show Radio New York Inter-
	0005	BBCWS(am)	Ţ	national Meridian-Masterpiece*
	0010	R. Prague	H S	Meridian-Music Saturday Music (classi-
	0015	R. Netherlands	F	cal/folk/jazz) From Saphire to Laser
	0030	BBCWS(am)	T W	(classical) Music Mix* UK Top 20
		R. New Zealand Int.	F A	World of Music The Sampler (latest
	0045	BBCWS(am)	Н	CDs) UK Album Chart
	*may b	e preempted for a Pro	A ms concer	Music X-Press* t
	Entertai	inment/Variety, Maga	ızine Sho	ws
		BBCWS(am)	H/A	Westway (drama se- rial)*
	*may b	e preempted on Sat. fo	or a Prom	
		edia and Communica WBCQ(7415kHz)	tions A	Allan Weiner World-
		Spanish Foreign R.	Α	wide (station manager) Radio Waves
	Lictoro	Contact/Interactive		
	0005	R. Australia	Α	Feedback
	0010	R. Japan	S	Hello from Tokyo
	0015	R. Prague		Mailbox
	0030	HCJB	S	Saludos Amigos
	0035	Spanish Foreign R. Spanish Foreign R.	A M	Radio Club Radio Club (rpt.)
	0017	Spunish Foloigh K.		Radio Clab (ipi.)
	Sport 0018	VOA News Now	S/A	Sports
		BBCWS(am)	S/M	Sports Roundup
		sts (*extended)	Page	43 Freqs
		BBCWS(am)	S	The World Today*
		,	M-A	News
		China R. Int.	D	News
		Deutsche Welle	D	News
		HCJB	D	Latin American & World News
		R. Australia	D	News
		R. Budapest	D	News
		R. Canada Int.	T-A	News
		R. Habana Cuba R. Netherlands	D S/M	International News News
		R. New Zealand Int.	D	News
		R. Prague	D	News
		Spanish Foreign R.	T-A	Ibero-American News*
		VOA News Now Voice of Russia	T-A D	World News News
		Voice of Vietnam	D	News
	0110	R. Habana Cuba	T-S	National News
	0114	VOA News Now	T-A T-A	Regional News USA News
	0114	VOA News Now R. Habana Cuba	T-S	News Bulletin
	0100	RTE, Ireland	T-S	The News at Six*
		VOA News Now	T-A	World News
		VOA Spec. Eng. Voice of Russia	T-A D	News News
		Affairs Magazines/Fe		
	0100	R. Netherlands	T-A	Newsline
	0105	Deutsche Welle	M	Talking Point (journal- ists)
		D. Atl:	T-A	Newslink
		R. Australia R. Australia	S A	Correspondents' Report Asia Pacific
	0110	R. Australia	M-F	Asia Pacific
		R. Habana Cuba	M	Weekly Review
		R. Netherlands	M	Wide Angle (week in review)
	0110	China R. Int.	S	Report on Developing Countries

Countries Current Affairs

Global Review

T-A Feature story

0022 VOA News Now

# **PROGRAMMING**

0	111	Voice of Russia	S	News and Views			T	The Law Report		R. Korea Int.	Н	Economic Radar
			M T-A	Sunday Panorama Commonwealth Update	0132	Voice of Russia	W A	The Religion Report Christian Message from Moscow		R. Budapest R. Sweden	M H	Europe Unlimited (trade-monthly) Money Matters
0	115	R. Habana Cuba	T-S	Viewpoint Opdate		Spanish Foreign R.	T-A	Spanish Language Course	0245	Swiss R. Int.	A	Business Spotlight
0	130	Deutsche Welle R. Austria Int.	T D	Insight Report from Austria	0154	VOA News Now Voice of Russia	T-F W	Feature report Russia: People and Events	Scione	/Technology (incl. He	alsh 9 E	nuironmant)
		VOA News Now	T-F	Dateline		AOICE OL VOZZIO	VV	kossia: Leobie aug Evenis		R. Australia	A	Ockham's Razor (issues)
0	140	R. Habana Cuba VOA Spec. Eng.	A A	Weekly Review In the News	Music 0105	R. New Zealand Int.	M_F	Cadenza (light classics)	0211	R. New Zealand Int. Voice of Russia	S T/F	Eureka! Science and Engineering
_			^	III IIIC NOWS			Α	Home Grown (NZ music)	0230	R. Australia	A	Earthbeat (environment)
		ss/Economics R. Budapest	M	Europe Unlimited (trade-biweekly)	0110	R. Prague Swiss R. Int.	S	Saturday Music (classical/folk/jazz) Sounds Good (Swiss music)*	0245	R. Sweden	F	Greenscan (ecology-2nd wk.) Heartbeat (health-3rd wk.)
0	115	Swiss R. Int.	Α	Business Spotlight	0130	HCJB	A	Musica del Ecuador				moundour (nounn ord ma)
		R. Prague China R. Int.	F W	Economic Report China Horizons	0130	R. Australia R. New Zealand Int.	S A	Oz Sounds Musical Chairs (featured artist)	Arts & 0200	<b>Cultural</b> HCIB	W	The Book & the Spade (archaeology)
0	130	R. Canada Int.	S	Canada Review (business/tech edition)		Voice of Russia	T	Folk Box	0215	R. Taipei Int.	Н	Journey into Chinese Culture
		Swiss R. Int. VOA News Now	A T-F	Business Spotlight Business News			W H	Jazz Show Musical Portraits (history)	0230	R. Korea Int. R. Sweden	W S	Cultural Promenade Spectrum (3rd wk.)
		лhl /: l l l l	L. 0 F.		0140	Codes D. Lea	F	Yours for the Asking		R. Budapest Swiss R. Int.	M H	Spotlight (monthly)
		<b>/Technology (incl. He</b> BBCWS(am)	T	Health Matters		Swiss R. Int. Voice of Russia	S F	Sounds Good (Swiss music)* Music At Your Request			П	Book Zone (2nd wk.)
			W F	Science View One Planet (ecology)	(*3rd/5	ith wks.)				ives and Views R. New Zealand Int.	M E	In Touch with New Zealand
			Α	Discovery (research)		inment/Variety, Maga			0210	R. Korea Int.	S	Seoul Report
0	130	Deutsche Welle R. Australia	W M	Man and Environment The Health Report	0100	WBCQ(7415kHz)	S A	Marion's Attic (vintage recordings) Tasha Takes Control	0215	R. Taipei Int.	W F	Taiwan Today Taipei Magazine
0	140	VOA Spec. Eng.	T	Agriculture Today	0105	BBCWS(am)	M	Wright Around the World (pop requests)			Α	Kaleidoscope (life in Taiwan)
			W/H F	Science Report Environment Report	0110	WWCR(3210kHz) Voice of Vietnam	T-A S	Golden Age of Radio Theatre Sunday Show	0230	R. Korea Int. R. Sweden	F S	Korea and Its Splendors Weekend (Europe magazine-1st wk.)
0		VOA News Now	T-F	Science News		Voice of Russia	M	Timelines		K. Swodon	3	Sweden Today (2nd wk)
		VOA Spec. Eng.	T W	Science in the News Explorations	SWL M	ledia and Communica	tions			Swiss R. Int.	D	Studio 49 (topical discussion-4th wk.) Newsnet (Swiss magazine)
0	150	R. Habana Cuba	M	Breakthrough	0100	R. Canada Int.	M	CIDX Report (biweekly)		Voice of Vienam	D	Current Affairs
A	ts & (	Cultural			0110	R. Budapest	S	DX Partyline DX Blockbuster	0232	Voice of Russia	M T	This is Russia Kaleidoscope (events)
0	105	R. New Zealand Int.		The Film Show	0130		Н	Ham Radio Today	0225	D. Dudanast	H	Moscow Yesterday and Today Heading for Hungary
0	110	R. Prague R. Budapest	S M	Readings from Czech Literature Spotlight (monthly)	0133	R. Australia VOA News Now	H S	The Media Report Communications World	0233	R. Budapest	M T-A	Hungary Today
n	115	R. Prague Deutsche Welle	M	The Arts Arts on the Air	0140	R. Habana Cuba	S/W	DXers Unlimited	0240	Swiss R. Int.	S M	The Name Game (geo quiz-1st wk.) Swiss Scene
		Swiss R. Int.	Н	Book Zone (2nd wk.)	0145	WWCR(5070 kHz.)	S	Ask WWCR	0245	R. Sweden	F	Nordic Report (1st wk.)
		China R. Int. R. Australia	S A	In the Spotlight Arts Talk	0147	Spanish Foreign R.	S	Radio Waves			Α	The S-Files (things Swedish-4th wk) Review of the Newsweek
·		R. Canada Int.	M	Canada Review (arts edition)		r Contact/Interactive					^	ROWOW OF THE HOWSWOOK
0	145	R. New Zealand Int. Swiss R. Int.	M	Bookmarks Book Zone (2nd wk.)	0100 0110	R. Canada Int. HCIB	M	Maple Leaf Mailbag Musical Mailbag	Intorm 0200	ational Features HCIB	F	Viewpoint (issues)
		VOA Spec. Eng.	Α	American Stories		R. Budapest	M	And the Gatepost (monthly)	0215	R. Taipei Int.	S	Great Wall Forum (mainland issues)
			Н	The Making of a Nation		R. Prague Swiss R. Int.	A S	Mailbox Capital Letters (2nd/4th wk.)			T F	Exploring the New Millennium Russian by Radio
		ves and Views		N		Voice of Vietnam	H	Letterbox	0235	R. Habana Cuba	S	The World of Stamps
0	100	Swiss R. Int. R. Canada Int.	D S	Newsnet (Swiss magazine) Canada Newsweek		China R. Int. Spanish Foreign R.	A A	Listeners' Garden Radio Club	0245	R. Taipei Int.	M-A	Let's Learn Chinese
0	105	R. Canada Int.	T-A	Canada Today Europe Unzipped		R. Habana Cuba	M	Mailbag Show	Music			William C. I. A A.
		R. Netherlands R. Prague	S M	Letter from Prague		Swiss R. Int. R. Austria Int.	S S	Capital Letters (2nd/4th wk.) Listeners' Letters		R. New Zealand Int.		Walkin' in the Sunshine (country) Home Grown (from 0105)
		Voice of Vietnam	T-A D	Current Affairs Current Affairs	0147	Spanish Foreign R.	M	Radio Club		R. New Zealand Int. R. Habana Cuba	M-F M	Wayne's Music (personal selections) From Habana
0	110	HCJB	T-A	Studio 9 (Latin America)	Sport					R. Korea Int.	M	Korean Pop Interactive (requests)
		Swiss R. Int.	S* M	The Name Game (Swiss geo quiz) Swiss Scene		BBCWS(am) Deutsche Welle	H F	Sports International (magazine) Hard to Beat: The World of Sport		R. Taipei Int. R. Habana Cuba	W	Jade Bells and Bamboo Pipes (traditional) The Jazz Place
		R. Budapest	M	Heading for Hungary (monthly)	0118	VOA News Now	T-A	Sports Report	0200	R. Korea Int.	Α	Notes of Nostalgia (traditional)
0	115	Deutsche Welle	T-A S	Hungary Today Inside Europe	0130	China R. Int. R. Australia	T F	Sports World The Sports Factor	0232	R. Sweden Voice of Russia	M S	Sounds Nordic (exc. 1st wk.) Songs from Russia
·		R. Prague	Ĭ	Spotlight (Czech current events) or	0105	RTE Ireland	S/M	Sportsnews			W	Musical Portraits
			Н	One on One (interview) Czechs in History or Central Europe Today	0135	R. Habana Cuba	T-A	Time Out	0240	Swiss R. Int.	S	Sounds Good (Swiss music-3rd/5th wk.)
0	120	R. Prague	W A	Talking Point From the Weeklies				- Page 43 Fregs	Enterto 0200	inment/Variety, Maga		
		Voice of Russia	M	Russia: People and Events		sts (*extended)		-			M H	Sunday Nite Adventures in Odyssey (children's stories)
0	130	China R. Int.	W	People in the Know Life in China	0200	BBCWS(am)(me) R. Australia	D D	The World Today* News		R. Australia Voice of Russia	S A	Margaret Throsby Interview Audio Book Club
		Deutsche Welle	H	Living in Germany		R. Habana Cuba	D	International News				AUGIO DOOK CIUD
		Swiss R. Int. Voice of Russia	D S	Newsnet (Swiss magazine) Moscow Yesterday and Today		R. Korea Int. R. New Zealand Int.	D n	News News	SWL, A 0200	ledia and Communica HCIR	tions S	Ham Radio Today
0		R. Austria Int.	M	Radio E (on Europe)		R. Taipei Int.	D	News	0200	WBCQ(9335kHz)	S	World of Radio
		R. Habana Cuba Swiss R. Int.	T/H/F S*	Caribbean Outlook The Name Game (Swiss geo quiz)	0230	Voice of Russia R. Budapest	D D	News News	0230	WWCR(5070kHz) R. Korea Int.	S M	Communications World Multiwave Feedback
			M	Swiss Scene		R. Habana Cuba	T-S	News Bulletin		WWCR(3215kHz)	Α	World of Radio
Ü	145	BBCWS(am) VOA Spec. Eng.	S F	Letter from America American Mosaic		Voice of Russia Voice of Vietnam	D D	News in Brief News	0240	WWCR(5070kHz) R. Budapest	S S	World of Radio DX Blockbuster
		Voice of Russia	Н	Russia: People and Events	C	Affaire Managines/F				·		
	1st w	•				Affairs Magazines/Fo R. Australia	M-F	The World Today	0211	r Contact/Interactive Voice of Russia	S/M/H	Moscow Mailbag
		tional Features Deutsche Welle	М	Religion and Society		R. Habana Cuba R. Korea Int.	T-S T-A	National News Seoul Calling	0230	R. Korea Int. R. Sweden	S M	From Us to You In Touch with Stockholm (1st wk.)
0	115	Deutsche Welle	Α	German by Radio		R. Korea Int. BBCWS(am)(me)	S	From Our Own Correspondent	0240	R. Budapest	M	And the Gatepost
		VOA News Now BBCWS(am)	T-A S	Feature report Reporting Religion		R. Sweden	M T-A	Assignment 60 Degrees North	0215	Swiss R. Int. R. Taipei Int.	S S	Capital Letters (2nd/4th wk.) Mailbag Time
U		DUCTTO (UIII)	T	Everywoman (magazine)	0245	BBCWS(am)	T/W/F/	A News Analysis		Voice of Russia	S	You Write to Moscow
			W	Focus on Faith Pick of the World (best of the BBC)			Н	From Our Own Correspondent	Sport			
			F	People and Places		ss/Economics			0205	R. Australia	S/A	Grandstand (live sports action*)
		China R. Int.	A H	Essential Guide Voices from Other Lands		Voice of Russia BBCWS(am)	W/A T-A	Newmarket World Business Report		R. New Zealand Int. R. Sweden	S/A T	Live Sport (in season) Sportscan
		R. Australia	S	Educational series		BBCWS(me)	A	Global Business			17580,	17750, 21725 kHz. only.)

	0300	UTC	- Page 44 Freqs		BBCWS(sas)	Α	From Where I Stand (2nd or 3rd wk.)	0410	China R. Int.	S	Report on Developing Countries
	usts (*extended) BBCWS(am)	S/M	World Briefing*		R. Sweden	F	Nordic Report (1st wk.) The S-Files (things Swedish-4th wk.)			M-F A	Current Affairs Global Review
0300	` '	T-A	News			A	Review of the Newsweek		HCJB	T-A	Studio 9 (on Latin America)
	BBCWS(me)(af) BBCWS(sas)	D S	World Briefing* World Briefing*	Informa	tional Features			0420	R. Habana Cuba BBCWS(me)(sas)	T-A A	Spotlight on the Americas Assignment
	ppcw3(sus)	M-A	News	0320	China R. Int.	Н	Voices from Other Lands	0430	BBCWS(af)	M-F	Network Africa
	China R. Int. Deutsche Welle	D D	News News	0330	BBCWS(am)	W H	Patterns of Faith Language Steamrollers (tracing "dead" languages)	0.455	R. Netherlands R. Netherlands	T-A S	Newsline Insight (commentary)
	R. Australia	D	News			F	Heart and Soul (religion)			,	magni (commonary)
	R. Habana Cuba R. New Zealand Int.	D S/A	International News News	0332	Deutsche Welle R. Australia	A A	German by Radio Educational series		ss/Economics Voice of Russia	Н	Newmarket
		M-F	Pacific Regional News	0002	Voice of Russia		20th Century	0413	R. Vlaanderen Int.	F	Economics
	R. Prague R. Taipei Int.	D D	News News	Music					Swiss R. Int. BBCWS(eu)	A S	Business Spotlight Global Business
	Voice of Russia	D	News		BBCWS(am)	W	The Alternative (rock)		China R. Int.	W	China Horizons
	R. Habana Cuba R. Habana Cuba	T-S D	National News News Bulletin			H F	The Greenfield Collection (classical requests) Jazzmatazz	0445	Swiss R. Int.	A	Business Spotlight
0000	Voice of Russia	D	News in Brief			A	Composer of the Month		/Technology (incl. Ho		
	Voice of Vietnam	D	News	0305	R. New Zealand Int. A		Top 5 (pop/rock) feature or series		R. Australia Voice of Russia	A W/A	Pacific Focus-Environment Science and Engineering
	Affairs Magazines/F				R. Prague	S	Saturday Music (classical/folk/jazz)	0413	R. Vlaanderen Int.	W	Green Society (ecology)
0305	BBCWS(sas) Deutsche Welle	T-A S/M	Outlook Weekend Review	0315		T-A A	Rendezvous (inspirational) Inspirational Classics	0430	WWCR(5070 kHz.)	M	New Horizons
		T-A	Newslink		R. New Zealand Int.	T	New Releases		d Culture		W - 11 - C / \
	R. New Zealand Int.	W F	Pacific Report Dateline Pacific	0335	R. Sweden R. New Zealand Int.	M S	Sounds Nordic (rock-exc. 1st wk.) World of Music	0405	BBCWS(sas)	T H	Meridian-Screen (cinema) Meridian-Writing (books)
0310	China R. Int.	S	Report on Developing Countries		R. Australia	M	Australian Music Show (modern rock)		R. Australia	S	Pacific Focus-Arts
		M-F A	Current Affairs Global Review			T/F W	Music Deli (international) Blacktracker (Aboriginal)	0413	R. New Zealand Int. R. Vlaanderen Int.	M H/A	Tagata o te Moana (Pacific culture) Around the Arts
0211	R. Habana Cuba	W	Weekly Review	0245	IICID	H W	Oz Country Style	0415	Swiss R. Int.	H .	Book Zone (2nd wk.)
0311	Voice of Russia	M T-A	Sunday Panorama News & Views	0345	пив	VV	Wonderful Words of Life (hymns)		China R. Int. R. Australia	S S	In the Spotlight Arts Talk
	R. Habana Cuba	T-S	Viewpoint		inment/Variety, Maga				Swiss R. Int.	Н	Book Zone (2nd wk.)
0330	BBCWS(af) Deutsche Welle	M-F T	Network Africa Insight (international affairs)	0330	BBCWS(am) HCJB	M	Westway Omnibus (two episodes) Radio Reading Room (Christian lit.)	Local L	ives and Views		
	R. New Zealand Int. R. Sweden	F T-A	Pacific Correspondent 60 Degrees North	0222	Voice of Russia	T M	Unshackled (radio's oldest drama series) Audio Book Club		Swiss R. Int. R. Vlaanderen Int.	D T-A	Newsnet (Swiss magazine) Belgium Today
0340	R. Habana Cuba	T/F	Caribbean Outlook		Voice of Vietnam	W	Sunday Show		R. New Zealand Int.		In Touch with New Zealand (from 0205)
0245	BBCWS(me)	A TWFA	Weekly Review Analysis	0345	BBCWS(sas) BBCWS(am)	M-F T-A	Off the Shelf (book readings) Off the Shelf (book readings)	0408	R. Vlaanderen Int.	M T-A	Tourism in Flanders Press Review
0343	DDCW3(IIIe)	H	From Our Own Correspondent		bbcw3(uiii)	I-A	on the Shell (book reddings)	0410	Swiss R. Int.	S	The Name Game (geo quiz-1st wk.)
Rucino	ss/Economics				edia and Communica WWCR(5070 kHz.)		Spectrum	0/13	R. Vlaanderen Int.	M T	Swiss Scene Focus on Europe
0315	R. Taipei Int.	M	Taiwan Economic Journal		WHRI(5745 kHz.)	A	Dxing with Cumbre		R. Vlaanderen Int.	Н	Around Town
	R. Prague BBCWS(me)	F M	Economic Report World Business Review	0305	R. New Zealand Int.	Н	Pacific Dxers Report (biweekly) RNZI Talk (meet the staff-biweekly)	0420	R. Prague	A W	Tourism in Flanders Talking Point
0000	, ,	T-A	World Business Report				, "		BBCWS(me)(sas)	S	In Praise of God (worship service)
	China R. Int. R. New Zealand Int.	W W	China Horizons Tradewinds	0340	R. Habana Cuba	S/W	Dxers Unlimited		BBCWS(af)	S A	The Story of Africa Talkabout Africa
0345	R. Sweden	H	Money Matters		Contact/Interactive				BBCWS(eu)	Α	Weekend (magazine)
Science	e/Technology (incl. H	ealth & F	nvironment)	0305	BBCWS(sas) R. Australia	M S	Talking Point (global phone-in) Feedback		China R. Int.	M F	People in the Know Life in China
0315	Deutsche Welle	S	Spectrum	0015	R. New Zealand Int.	Н	Mailbox (biweekly)	0.400	Swiss R. Int.	D	Newsnet (Swiss magazine)
0330	BBCWS(am)(me)(sas Deutsche Welle	W ) 2	Science in Action Man and Environment		R. Prague China R. Int.	A A	Mailbox Listeners' Garden		Voice of Russia R. Netherlands	S	Moscow Yesterday and Today Europe Unzipped
0245	R. Australia R. Sweden	S F	Ockham's Razor	0330	BBCWS(am) R. Sweden	A M	Write On (exc. 2nd or 3rd wk.) In Touch with Stockholm (1st wk.)	0440	Swiss R. Int.	S M	The Name Game (geo quiz-1st wk.) Swiss Scene
0343	K. Sweden	Г	Greenscan (ecology-2nd wk.) Heartbeat (health-3rd wk.)	0340	R. Habana Cuba	Н	Mailbag Show	0446	Voice of Russia	W	Russia: People and Events
0350	R. Habana Cuba	M	Breakthrough	0345	BBCWS(me) BBCWS(sas)	M A	Write On (exc. 2nd or 3rd wk.) Write On (exc. 2nd or 3rd wk.)	Inform	itional Features		
Arts an	d Culture				DDCW3(sus)	н	Wille Oil (exc. 2lid of 3ld wx.)	0405	R. New Zealand Int.		Feature or series on religion
	R. Prague R. Prague	S M	Readings from Czech Literature The Arts	Sport	Channel Africa	Α	Channel Africa Sport		R. Vlaanderen Int. China R. Int.	F H	International Report Voices from Other Lands
0315	Deutsche Welle	M	Arts on the Air	0000	R. Australia	S/A	Grandstand (live action)*		R. Habana Cuba	S	The World of Stamps
	China R. Int. R. Sweden	S S	In the Spotlight Spectrum (3rd wk.)	0310	R. New Zealand Int. R. Australia	S/A M-F	Live Sport (in season) Sport (daily report)	Music			
0000	Voice of Russia	W/F	Russian history/culture program		BBCWS(am)	S/M	Sports Roundup	0400	R. Vlaanderen Int.		Music from Flanders
local I	ives and Views				BBCWS(me)(af) BBCWS(sas)	D S	Sports Roundup Sports Roundup	0405	BBCWS(sas)	M W	Meridian-Masterpiece* Meridian-Music
	R. Australia	A	Rural Reporter (outback)	0330	China R. Int.	Ī	Sports World	0410	R. Habana Cuba	M	From Habana
	R. Prague	M T-A	Letter from Prague Current Affairs		Deutsche Welle R. New Zealand Int.	F H	Hard to Beat: The World of Sport The World in Sport	0411	Swiss R. Int. Voice of Russia	S M	Sounds Good (Swiss music-3rd/5th) Musical Portraits (history)
0315	R. Prague	T	Spotlight (Czech current events) or One on One		R. Habana Cuba	T-A	Time Out	0424	R. Vlaanderen Int.	M-A	Soundbox (Flemish rock)
		Н	(interview) Czechs in History or Central Europe Today		R. Sweden al on 9660, 12080,	T 17580,	Sportscan 21725 kHz. only)	0430	BBCWS(sas)	M T	Music Mix* UK Top 20
0320	R. Australia	M-F	Pacific Focus				- Page 44 Freqs		IICID	H	World of Music
	R. Prague	W A	Talking Point From the Weeklies	Newsca	sts (*extended)		- rage rreqs		HCJB R. Australia	A A	Musica del Ecuador Jazz Notes
	Voice of Russia BBCWS(am)	M	Russia: People and Events Just a Taste (food and culture)	0400	BBCWS(eu)(me)(af) BBCWS(sas)	D S/A	The World Today* The World Today*	0422	R. Habana Cuba Voice of Russia	M M	The Jazz Place Jazz Show
0330	DDCW3(uiii)	Å	From Where I Stand (2nd or 3rd wk.)		, ,	M-F	News	0432	AOICE OL VOZZIO	T	Yours for the Asking
	BBCWS(af)	S A	Postmark Africa This Week and Africa or Africa Quiz		China R. Int. HCJB	D D	News Latin American & World News			W	Musical Portraits (history) Folk Box
	China R. Int.	M	People in the Know		R. Australia	Ď	News		Swiss R. Int.	S	Sounds Good (Swiss music-3rd/5th)
	Deutsche Welle	F H	Life in China Living in Germany		R. Habana Cuba R. New Zealand Int.	D D	International News News	0445	BBCWS(sas)	W F	UK Album Chart Music X-Press
	R. Sweden	S	Weekend (Europe magazine-1st wk.)		R. Vlaanderen Int.	T-S	News		Voice of Russia	T	Music At Your Request
		,	Sweden Today (2nd wk.) Studio 49 (topical discussion-4th wk.),	0430	Voice of Russia R. Habana Cuba	D T-S	News News Bulletin	*may b	e preempted for Prom	s concert	
	R. Taipei Int.	W	Women in Taiwan	. 100	R. Netherlands	S/M	News		inment/Variety, Mag		
		H A	Life Unusual Carol's Café		Voice of Russia	D	News in Brief		WBCQ(7415 kHz.) R. New Zealand Int.		Amos 'n Andy (classic radio comedy) Playhouse (radio theatre)
	Voice of Russia	S	Kaleidoscope (Russian events)		Affairs Magazines/Fe		0	0410	R. Australia	M-F	Margaret Throsby Interview
U345	BBCWS(me)	M	From Where I Stand (2nd or 3rd wk.)	0405	BBCWS(sas)	F	Omnibus (documentary)	U43U	BBCWS(sas)	W/F	Westway (drama serial)*

57

0432 Voice of Ru		Audio Book Club		R. Netherlands	Н	Documentary		R. Australia	M-F	Pacific Focus
*may be preempted	on Fri. for Proms	Timelines concert		Deutsche Welle R. New Zealand Int.	M S	Religion and Society Religious series	0630	BBCWS(eu)(eas) BBCWS(wcaf)	A M-F	People and Politics Network Africa
SWL, Media and Co			0515	Deutsche Welle BBCWS(eu)(sas)	M	Cool (teen magazine) Reporting Religion		R. New Zealand Int.	Α	African Quiz or This Week and Africa Today in Parliament
0400 R. Vlaande	ren Int. M	Radio World	0300	BBCWS(sas)	M	People and Places	0645	BBCWS(eu)	M	Letter from America
WBCQ(741 0410 HCJB	5kHz) S S	Tom and Darryl DX Partyline			T W	Essential Guide Everywoman		BBCWS(me)(esaf)	Α	From Where I Stand (2nd or 3rd wk.)
0430 HCJB	H 5 kHz.) S	Ham Radio Today Dxing with Cumbre			H F	Focus on Faith Pick of the World (BBC's best)		ational Features BBCWS(eas)	M	Omnibus (documentary)
•		DXIIIG WIIII CUIIDIE		China R. Int.	H	Voices from Other Lands		R. Australia	S	The Europeans
Listener Contact/In 0410 HCJB	teractive M	Musical Mailbag		Deutsche Welle R. Australia	A A	German by Radio Lingua Franca (about language)	0625	R. Japan	T H	Let's Learn Japanese Brush Up Your Japanese
Swiss R. In 0411 Voice of Ru		Capital Letters (2nd/4th wk.) Moscow Mailbaa	0547	Spanish Foreign R.	T-A	Spanish Language Course	0635	R. Habana Cuba	S	The World of Stamps
0414 R. Vlaande	ren Int. M	Brussels 1043	Music				Music			
0420 China R. In 0430 R. Habana		Listeners' Garden The Mailbag Show	0500	HCJB	F A	Inspirational Classics Walkin' in the Sunshine (country)	0600	HCJB	T A	Chords of Love (sacred) Wonderful Words of Life (hymns)
0435 R. Netherla 0440 Swiss R. In		Sincerely Yours Capital Letters (2nd/4th wk.)	0510	R. Netherlands R. Japan	W S	Music 52-15 (international) Pop Goes Asia	0405	WWCR(5070kHz) BBCWS(eas)	M T	Ken's Country Classics Meridian-Masterpiece*
0445 WWCR(507		Ask WWCR	0515	R. Netherlands	F	From Saphire to Laser (classical)	0003		Н	Meridian-Music
Sport			0530	R. Australia R. Habana Cuba	S M	Fine Music Australia (classical) The Jazz Show		WHRI(7315kHz) WWCR(3210kHz)	A S	Turn Your Radio On The Big Backyard (Aussie country)
0400 R. Australia R New Zer	S/A Iland Int. S/A	Grandstand (live action)* Live Sport (in season)	Entert	ainment/Variety, Mag	azine Sha	ows.	0610	R. Habana Cuba R. Japan	M A	From Havana (Cuban musicians) Pop Goes Asia
0418 R. Vlaande	ren Int. T	Sports		HCJB	M	Sunday Nite	0625	R. Japan	M	Unforgettable Masterpieces Japan Music Loa
0430 China R. In 0450 BBCWS(eu)	(me) M-F	Sports World Sports Roundup		BBCWS(sas)	H A	Adventures in Odyssey (stories) Wright Around the World (pop requests)			W F	Music Beat (pop)
(*special on 9660	, 12080, 17580	, 17750, 21725 kHz. only.)	0545	R. Australia	Α	Short Story	0630	R. New Zealand Int. BBCWS(eas)	A M	In a Mellow Tone (easy jazz) Composer of the Month
Newscasts (*extend		- Page 45 Freqs		Media and Communica WWCR(3210 kHz.)		World of Radio		, , ,	T W	Music Mix* UK Top 20
0500 BBCWS(eu)	(me)(af)(eas)	D The World Today*		WHRI `	Α	Dxing with Cumbre		ucin	F	World of Music
BBCWS(sas	) S M-A	The World Today* News		WWCR(3210 kHz.) R. Habana Cuba	M S/W	Communications World Dxers Unlimited		HCJB R. Australia	T-A A	Nightsounds (inspirational) Oz Sounds
China R. In Deutsche V		News News	0547	Spanish Foreign R.	S	Radio Waves	0640	R. Australia	M T/F	Australian Music Show (modern rock) Music Deli (nternational)
R. Australia	ı D	News		er Contact/Interactive		Calculate Acciona			W	Blacktracker (Aboriginal)
R. Habana R. Japan	D	International News News		HCJB WWCR(5070 kHz.)		Saludos Amigos Ask WWCR	*may	be preempted for a Pro	H oms conce	Country Style rt.
Spanish Fo 0510 R. Habana		Ibero-American News* National News		R. Japan China R. Int.	A A	Hello from Tokyo Listeners' Garden	Entert	ainment/Variety, Mag	azine Sha	ows
0530 R. Habana Voice of Ni	Cuba T-A	News Bulletin News	0530	BBCWS(eas) Spanish Foreign R.	S	Write On Radio Club	0605	R. New Zealand Int. BBCWS(eas)		Storytime Westway Omnibus (drama serial)
	•	M6M2	0540	R. Habana Cuba	M/H	Mailbag Show		BBCWS(eas)	Н	Panel game or Quiz
Current Affairs Mag 0500 R. New Zeo		Checkpoint	054/	Spanish Foreign R.	M	Radio Club	0645	BBCWS(me)(esaf) R. New Zealand Int.	M-F M-F	Off the Shelf (readings) Storytime
0505 Deutsche V	/elle S T-A	Talking Point (journalists) Newslink	Sport 0500	R. Australia	S/A	Grandstand (live action)*	SWI	Media and Communic	ıtinns	
0510 China R. In	t. S	Report on Developing Countries		BBCWS(sas)	F	Sports International (magazine)	0600	WWCR(3210kHz)	M	Spectrum
	M-F A	Current Affairs Global Review	0530	R. Australia China R. Int.	A T	Pacific Focus-Sport Sports World	0630	WHRI (5745kHz) WWCR(5070kHz)	A S	Dxing with Cumbre World of Radio
R. Australia R. Habana		Pacific Beat Weekly Review		Deutsche Welle R. Australia	F M-F	Hard to Beat: The World of Sport Sport (daily report)	Listen	er Contact/Interactive		
0515 R. Habana		Viewpoint 44 Minutes		R. Habana Cuba	T-A	Time Out . 17750, 21725 kHz. only.)	0600	HCJB	S	Saludos Amigos Talking Point (global phone-in)
R. Japan 0530 BBCWS(af)	M-F	Network Africa	( spec	,				BBCWS(me)(esaf) R. Australia	M S	Feedback
Deutsche V 0540 R. Habana		Insight (international affairs) Caribbean Outlook	News	asts (*extended)	UTC	- Page 45 Freqs	0645	BBCWS(me)(esaf)	A	Write On (exc. 2nd or 3rd wk.)
	A	Weekly Review	0600	BBCWS(eu)(wcaf)	D S	World Briefing* World Briefing*	Sport	R. Australia	S/A	Grandstand (live action)*
Business/Economi					M-A	News	0610	R. Australia	M-F	Sport (daily report)
0500 R. Netherla		A Good Life (development) Pacific Focus-Business		BBCWS(eas)	S/A M-F	World Briefing* News	0620	BBCWS(eu)(wcaf) BBCWS(me)(wcaf)	D S	Sports Roundup Sports Roundup
0515 Deutsche V 0530 BBCWS(me		Marks and Markets Global Business		R. Australia R. Habana Cuba	D D	News International News	(*sner	BBCWS(eas)	S/A 17580	Sports Roundup 17750, 21725 kHz. only.)
China R. In		China Horizons		R. Japan	D	News	( 5000			
Science/Technology			0630	R. New Zealand Int. R. Habana Cuba	T-S	News News Bulletin	Newsc	asts (*extended)		- Page 47 Freqs
0500 R. Netherla 0505 BBCWS(sas		Research File One Planet (ecology)	Currer	t Affairs Magazines/F	eatures		1000	BBCWS(am)(eu)(me) BBCWS(af)(eas)	S	World Briefing* News Summary
,,,,,,	T W	Discovery Health Matters	0605	BBCWS(me)(esaf) R. Habana Cuba	T-A T-S	Outlook (magazine) Spotlight on the Americas		BBCWS(esaf) BBCWS(wcaf)	M-A A	World Briefing* World Briefing*
0500 0	Н	Science View	0615	R. Japan	M-F	Asian Top News (region's radio)		BBCWS(eas)	M-F	World Briefing*
0530 Deutsche V	/elle W	Man and Environment	0630	BBCWS(eu)(me)(af) R. New Zealand Int.	S M	Agenda (trends) Letter from America		R. Australia	A D	News News
Arts and Culture 0500 R. Netherla	nds S	Aural Tapestry	0645	BBCWS(eu)	F T/W/F	The Pacific Report Analysis		R. New Zealand Int. VOA News Now	D D	News World News
0510 R. New Zeo	land Int. S	Whenua! (Maori culture)			H	From Our Own Correspondent		VOA News Now	D	Regional News
0520 China R. In 0530 BBCWS(eu)	(me)(eas) A	In the Spotlight Arts in Action		ess/Economics BBCWS(eu)	M-F	World Business Report		VOA News Now VOA News Now	D D	USA News World News
BBCWS(af)	S	Artbeat (arts in Africa)	Scienr	e/Technology (incl. H	ealth & F	nvironment)	Curren	t Affairs Magazines/F	eatures	
Local Lives and Vi 0500 R. Netherla		Dutch Horizons	0600	R. Habana Cuba R. New Zealand Int.	M	Breakthrough Eureka!		R. Australia R. New Zealand Int.	M-F	Asia Pacific Late Edition
	F	Talking It Over (interviews)			m	LOIONU:	1030	BBCWS(am)(me)	S	Agenda (trends)
0510 R. New Zeo 0530 BBCWS(esc	f) A	Best of Kim Hill (interviews) Africa Quiz or This Week and Africa		nd Culture BBCWS(eas)	W	Meridian-Screen (film/cinema)		BBCWS(esaf)	T-F	Analysis
BBCWS(wo	ıf) A	Talkabout Africa From Where I Stand		R. New Zealand Int.	F	Meridian-Writing (books) What's Going On		ess/Economics BBCWS(am)(eu)(eas)	M-F	World Business Report
China R. In	ť. M	People in the Know			m-1	ar 5 borng off		VOA News Now	M-F	Business and Economic Report
Deutsche V	F /elle H	Life in China Living in Germany	0605	Lives and Views R. New Zealand Int.		Focus on Politics		e/Technology (incl. H		
Informational Feat	ıres		0610	R. Japan	S	Weekend Square (Japanese life)	1030	BBCWS(am)(eu)(me) R. Australia	(af) M	A Science in Action Health Report
0500 HCJB	W	The Book & the Spade (archaeology)						100110110		

W The Book & the Spade (archaeology)

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1045	VOA News Now	A M-F	In Conversation Science, Medicine, Environment		R. Sweden	H	Nordic Report (1st wk.) The S-Files (things Swedish-4th wk.) Review of the Newsweek	1245	BBCWS(esaf) R. Sweden	F H	Body and Mind (health) Greenscan (ecology-2nd wk.) Heartbeat (3rd wk.)
	ives and Views			(*specia	al to Caribbean on 6	195, 152					nounbour (ord w.)
	R. Australia BBCWS(eu)	A S	Pacific Review Weekend	Informa	itional Features				<b>d Culture</b> R. Sweden	Α	Spectrum (3rd wk.)
	BBCWS(esaf)	M	Letter from America	1105	BBCWS(me)	W	Omnibus (documentary)				Speciality (ord may
	R. Australia	S	Rural Reporter	1125	R. Japan	T H	Let's Learn Japanese Brush Up Your Japanese		ives and Views R. Australia	М-Н	Late Night Live (discussion)
	ational Features			1130	BBCWS(eas)	M	Everywoman		R.Sweden	A	Weekend (Europe magazine-1st wk.)
	BBCWS(wcaf) R. Australia	S S	Heart and Soul (religion) Linava Franca (about lanavaae)			T W	Focus on Faith Pick of the World (BBC's best)				Sweden Today (2nd) Studio 49 (discussion-3rd)
	BBCWS(me)	M-F	World Learning			Н	People and Places		YLE R. Finland	S	Capital Cafe (conversations)
	R. Australia	T W	Law Report Religion Report			F	Essential Guide			M-F A	Finland This Morning Finland This Week
	VOA News Now	S	On the Line (US foreign policy)	Music	HCID	•	H : C // )	1245	R. Sweden	Н	Nordic Report (1st)
1045	BBCWS(wcaf)	S	A Radio History of the World	1100	WWCR(15685kHz)	S F	Morning Song (hymns) The Big Backyard (Australian country)			F	The S-Files (things Swedish-4th) Review of the Newsweek
Music		,	Constant Hall Administration	1105	BBCWS(me)	T	Meridian-Masterpièce*	l=f	ω		
1001	BBCWS(eas) BBCWS(esaf)	S	Concert Hall (classical) The Alternative (eclectic)	1110	R. Japan	H A	Meridian-Music Pop Goes Asia		<b>rtional Features</b> R. Australia	Α	The Spirit of Things (spiritual matters)
	BBCWS(eas) R. New Zealand Int.	A	Jazzmatazz Deep Purple (relaxing)	1125	R. Japan	M W	Unforgettable Masterpieces	1224 1230		M-F A	Mission Network News Adventures in Odyssey (stories)
1020	BBCWS(wcaf)	S	The Alternative (eclectic)			F	Japan Music Log Music Beat (pop)		BBCWS(eu)(esaf)	M	A Radio History of the World
1030	BBCWS(wcaf) BBCWS(eas)	S A	Composer of the Month Greenfield Collection (classical requests)	1130	BBCWS(me)	M T	Composer of the Month Music Mix*			T F	Heart and Soul (religion) Patterns of Faith
			greenilein collection (cinzzich ledneziz)			W	UK Top 20		BBCWS(eas)	M	Patterns of Faith
	<b>Aedia and Communio</b> R. New Zealand Int.		Mediawatch		BBCWS(esaf)	F A	World of Music Greenfield Collection (classical requests)			T W	A Radio History of the World Heart and Soul (religion)
	R. Australia	H	Media Report		R. Australia	Α	Find Music Australia (classical)		YLE R. Finland	A	Starting Finnish (language lesson)
Sport					R. New Zealand Int. R. Sweden	F S	RNZI Top 5 Sounds Nordic (rock/pop-exc.1st wk.)	Music			
	BBCWS(am)(eu)(me	S/A	Sports Roundup	*may b	e preempted for Prom			1200	R. Sweden	S	Sounds Nordic (rock-exc. 1st wk.)
1030	BBCWS(wcaf) R. Australia	S F	Sports Roundup Sports Factor	Enterto	inment/Variety, Mag	azine Sh	ows	1205	BBCWS(eu) R. Australia	S S	The Alternative (eclectic) Country Club
	BBCWS(am)(eu)(esa	f)(eas)	M-F Sports Roundup		BBCWS(me)	Α	Wright Around the World (pop requests)		K. Additalia	F	Sound Quality (innovative)
	1100	UTC	- Page 48 Freqs	1130	BBCWS(esaf) BBCWS(me)	A H	Westway Omnibus (drama serial) Panel game or Quiz	Enterto	inment/Variety, Mag	azine Sh	nws
	sts (*extended)		-		BBCWS(eas)	S	Play of the Week (radio theatre)		BBCWS(eas)	S	Play of the Week (from 1130)
1100	BBCWS(am)(eu) BBCWS(me)	D S	World Briefing* World Briefing*		HCJB	M-F	Morning in the Mountains	1205	HCJB BBCWS(eu)(esaf)	M-F W	Morning in the Mountains (from 1130) Best of "The Edge" (youth culture)
		M-A	News		ledia and Communica		of node.		BBCWS(eu)	A	Wright Around the World (pop requests)
	BBCWS(esaf)	S-F A	World Briefing* News	1100	WWCR(15685kHz)	W W	or Kaalo Communications World	1245	BBCWS(eas) BBCWS(eas)	A H	Panel game or Quiz Best of "The Edge" (youth culture)
	BBCWS(eas)	S/A M-F	World Briefing* News	1130	WHRI (9495kHz)	Α	Dxing with Cumbre	CWI A	ledia and Communica	stions	
	R. Australia	D	News		r Contact/Interactive					A	Dxing with Cumbre
	R. Japan R. New Zealand Int.	D D	News News		R. Japan R. Sweden	S	Hello From Tokyo In Touch with Stockholm (1st wk.)	1230	WHRI(15105kHz) WWCR(15685kHz)		Dxing with Cumbre World of Radio
1120	BBCWS(am)(eu)(wcc	rf)D	British News		N. SWOUGH	,	iii toocii wiiii Siockioiiii (131 wk.)			^	World of Radio
	BBCWS(me) BBCWS(esaf)	S S-F	British News British News	<b>Sport</b> 1105	R. New Zealand Int.	ς	Sportsworld		r Contact/Interactive   WWCR(15685kHz.)	S/M	Ask WWCR
	BBCWS(eas)	S/A	British News		n. non zouluna im.	Ā	The World in Sport		R. Sweden	\$	In Touch with Stockholm (1st wk.)
Current	t Affairs Magazines/I	eatures		1110	BBCWS(am)	h M-F	Sports Story Caribbean Sport*	Sport			
	BBCWS(am)	M-F	Caribbean Report*		BBCWS(wcaf)	F	Fast Track	1205		M-F	Sports News
	R. Australia	S M-A	Correspondents Report Asia Pacific		BBCWS(eas) R. Australia	W M-F	Sports International Sports Report		R. New Zealand Int.	S A	The World in Sport Sports Story
	R. Japan	M-F	Asian Top News (region's radio)	1145	BBCWS(am)(eu)	M-H/A		1245	R. Sweden	M	Sportscan
1130	BBCWS(am)(eu)	TWFA H	News Analysis From Our Own Correspondent		BBCWS(am)(eu)(af) BBCWS(af)	F M-H	Football Extra Sports Roundup		1300	UTC	- Page 49 Freqs
/*cnoci	R. Sweden al to Caribbean on 6	M-F	60 Degrees North	(*cnocie			Sportscan	Newsco	sts (*extended) BBCWS(am)(me(af)	n	News
		173, 13	.20 KHZ. UHIY)	( specii	al to Caribbean on 6			1300	BBCWS(eu)	S/A	Newshour*
Busine 1128	ss/Economics	M-F	Money Minute	Nowern	1 200 sts (*extended)	UTC	- Page 48 Freqs		BBCWS(eas)	M-F D	News Newshour*
1130	BBCWS(af)	M-F	World Business Report		BBCWS(am)(me)(wo		D Newshour*		China R. Int.	D	News
1145	R. Sweden	W	Money Matters		BBCWS(eu) BBCWS(esaf)	D S/A	News Newshour*		R. Australia R. Canada Int.	D D	News News
	e/Technology (incl. H				, ,	M-F	News		R. New Zealand Int.		News
1105	BBCWS(eas)	M T	Health Matters Science View		BBCWS(eas) HCJB	M-A M-F	News Latin American & World News	Current	Affairs Magazines/F	eatures	
		H	One Planet (ecology)		R. Australia	D	News		BBCWS(am)	M-F	Outlook
1130	BBCWS(eas)	A	Discovery Science in Action		R. Canada Int. R. New Zealand Int.	M-F M-F	News Late Edition*	1310	R. Canada Int. China R. Int.	M-F S	This Morning (from 1210) Report on Developing Countries
1145	R. Sweden	Н	Greenscan (ecology-2nd wk.)		BBCWS(am)	M-F	Caribbean Report			M-F	Current Affairs
			Heartbeat (health-3rd wk.)	1230	R. New Zealand Int.	M-F S	Latin American & World News New Zealand News		R. Canada Int.	A S	Global Review The Sunday Edition (arts/politics/ideas)
	d Culture BBCWS(me)	W	Meridian-Screen (film/cinema)	( ^ spe	cial to Caribbean on	6195, 1	15220 kHz. only)	1330	R. Sweden	M-F	60 Degrees North
1103	DDCW3(IIIe)	F	Meridian-Writing (books)		Events Magazines/F				ss/Economics		
1130	BBCWS(am)(eu)(me R. Sweden	(esaf) S	S Arts in Action Spectrum (3rd wk.)		BBCWS(eu)(esaf)(eas R. Canada Int.	s) M-F M-F	Outlook (magazine) This Morning		BBCWS(am) China R. Int.	A W	Global Business China Horizon
		J	Specifolii (Siu wk.)		BBCWS(eas)	S	Agenda (trends)	1330	BBCWS(me)	S	Global Business
	ives and Views R. New Zealand Int.	W-H	Kim Hill (interviews)		R. Sweden	A M-F	Assignment 60 Degrees North		R. Sweden BBCWS(eas)	W M-F	Money Matters World Business Report
1115	BBCWS(am)	M-F	Caribbean Magazine*	_		111-1	SS POGIOUS HOIIII				·
1130	BBCWS(am)(eu) BBCWS(wcaf)	M S	Letter from America Postmark Africa		ss/Economics BBCWS(am)	M-F	Caribbean Business*		Technology (incl. He BBCWS(me)	alth & Er M	ivironment) Discovery
	R. Australia	S	Country Breakfast	1230	BBCWS(eu)	Α	Global Business	1003	556115(1110)	T	Health Matters
	R. Sweden	A	Weekend (Europe magazine-1st wk.) Sweden Today (2nd wk.)		R. Sweden al to Caribbean on 6	W 195, 15	Money Matters 220 kHz. onlv)			W F	Science View One Planet (ecology)
1105	D. A P		Studio 49 (discussion-4th wk.)					1045	R. Australia	A	The Science Show
	R. Australia R. New Zealand Int.	M-F A	Life Matters (social issues) Dateline Pacific		/Technology (incl. H BBCWS(eu)(esaf)	ealth & I H	Environment) Body and Mind (health)	1345	R. Sweden	Н	Greenscan (ecology-2nd wk.) Heartbeat (health-3rd wk.)
					,		• •				•

Arts/Culture 1305 BBCWS		W F S	Meridian-Screen (film/cinema) Meridian-Writing (books) In the Spotlight		<b>d Culture</b> BBCWS(am) R. Australia	T H S	Meridian-Screen (film) Meridian-Writing (books) Books and Writing	1530	Lives and Views China R. Int. R. Australia	M F T W	People in the Know Life in China The Law Report The Religion Report
1330 BBCWS R. Swei		A A	Arts in Action Spectrum (3rd Sat.)	1420	China R. Int.	S	In the Spotlight		R. Austria Int. BBCWS(eu)	A F	Radio E (on Europe) The New Europe (last wk.)
		^	Specifoli (ora Sui.)		ives and Views				. ,		THE NEW EUROPE (IUSI W.C.)
<b>Local Lives and</b> 1310 R. Cand		Α	The House (Canadian politics)		R. Japan China R. Int.	S M	Weekend Square People in the Know		ational Features BBCWS(eas)	F	Omnibus (documentary)
330 China F	R. Int.	M F	People in the Know		D. Consider last	F F	Life in China		R. Australia	S	Encounter (spiritual beliefs) Voices from Other Lands
330 BBCWS	S(am)(esaf)	A	Life in China People & Politics (Parliament)	1445	R. Canada Int. R. Canada Int.	M-H	C'est La Vie (life in Quebec) Out Front (personally produced radio)		China R. Int. BBCWS(am)	H M	People and Places
R. Swe	eden	Α	Weekend (Europe magazine-1st wk) Sweden Today (2nd wk.)	Informe	itional Features					T W	The Essential Guide Everywoman
345 R. Swei	ndon.	Н	Studio 49 (discussion-4th wk.) Nordic Report (1st wk.)	1405	R. Australia China R. Int.	A H	New Dimensions ("progressive" ideas) Voices from Other Lands			H F	Focus on Faith Pick of the World (best of the BBC)
343 K. 3W6	uen		The S-Files (things Swedish-4th wk.)		BBCWS(eu)(wcaf)	M	Essential Guide		BBCWS(af)	M-F	World Learning
		F	Review of the Newsweek			T W	Everywoman Focus on Faith	1545	BBCWS(me)	M T	Patterns of Faith A History of the World
I <mark>nformational F</mark> 1305 BBCWS		M	Omnibus (documentary)			F	People and Places			W	Heart and Soul (religion) Best of "The Edge" (youth culture)
320 China F	R. Int.	Н	Voices from Other Lands	Music	DDCHIC/ )		n de nome				bost of the Eagle (your conord)
1330 BBCWS BBCWS		S M	In Praise of God Essential Guide	1405	BBCWS(am)	M W	Meridian-Masterpiece Meridian-Music	<b>Music</b> 1505	BBCWS(am)(eu)(me		Concert Hall
		T W	Everywoman Focus on Faith		R. Australia R. Japan	M-F S	The Planet (from 1315) Pop Goes Asia		BBCWS(eas)	S M	The Alternative (eclectic) Meridian-Masterpiece*
НСІВ		F M-F	People and Places Focus on the Family	1430	BBCWS(am)	M T	Music Mix UK Top 20		R. Australia	W	Meridian-Music Melisma (innovative)
1356 HCJB		M-F	Today's Father			Н	World of Music	1530	BBCWS(eas)	M	Music Mix*
358 HCJB		M-F	Parent Talk Tip	1445	BBCWS(am)	W F	UK Album Chart Music X-Press			T H	UK Top 20 World of Music
<b>Music</b> 1305 BBCWS	(mm)	S	Jazzmatazz	Entorto	inment/Variety, Mag	uzina Ch	OME	1545	BBCWS(eas)	W	UK Album Chart Music X-Press
		T	Meridian-Masterpiece*	1400	Channel Africa	S/A	Channel Africa Extra (from 1300)	(*may	be preempted for a F	roms cond	
BBCWS		H S	Meridian-Music The Alternative (eclectic)	1405	BBCWS(eu)(wcaf) R. Canada Int.	H A	Pick of the World (BBC's best) Vinyl Cafe (humor)	Enterto	inment/Variety, Mag	jazine Sh	ows
BBCWS BBCWS	S(me)(wcaf)	A S	Jazzmatazz Concert Hall (classical)	1430	BBCWS(am) HCJB	W/F A	Westway (drama serial) Alive! (Christian lifestyles)	1500	HCJB BBCWS(af)	A S	Alive! (from 1430) Play of the Week (radio theatre)
R. Aust	tralia	S M-F	Country Club (from 1205)	CWI II			Airro. (cinishun mosiyios)		BBCWS(eas)	W/F	Westway (drama serial) Weekend Magazine
1315 R. Aust 1330 BBCWS		M	The Planet (international) Composer of the Month		ledia and Communica WHRI (6040kHz)	S/A	Dxing with Cumbre		HCJB	A	weekena magazine
		T W	Music Mix* UK Top 20	Listene	r Contact/Interactive	,			<b>Aedia and Communio</b> WHRI(15105kHz)		Dxing with Cumbre
BBCWS	(Inza)	F A	World of Music Jazzmatazz		BBCWS(all) China R. Int.	S A	Talking Point (current events call-in) Listeners' Garden	1530	R. Australia	Н	The Media Report
R. Swei	eden	S	Sounds Nordic (rock/pop-exc. 1st wk.)		Cillia K. IIII.	-	Elsionois outdon		r Contact/Interactive		10. 70.1
(*may be preen			•	Sport 1405	BBCWS(all)	Α	Sportsworld (live action)		China R. Int. R. Austria Int.	A A	Listeners' Garden Listeners' Letters
ntertainment/ 300 Channe	<b>/Variety, Mago</b> el Africa	<b>izine Sh</b> o S/A	nws Channel Africa Extra (weekend variety)	1430	BBCWS(eu)(wcaf) China R. Int.	H T	Sports International Sports World	Sport			
HCJB 1330 BBCWS		S H	Weekend Magazine Panel game or Quiz		BBCWS(me)(esaf)(e	ıs) E	M-H Sports Roundup Football Extra		BBCWS(am)	F A	Sports International Sportsworld (from 1405)
BBCWS	S(me)	Н	Pick of the World (BBC's best)					1530	China R. Int.	T	Sports World
345 BBCWS	, ,	M-F	Off the Shelf (book readings)		sts (*extended)		- Page 50 Freqs		R. Australia	F	The Sports Factor
istener Contact	ct/Interactive (15685kHz)A	Ask WW	CR	1500	BBCWS(am)(me)(af) BBCWS(eu)	(eas) S/A	D News News	Newsc	1 600 usts (*extended)	UTC	- Pago 51 Froqs
320 China F	Ř. Int.	A S	Listeners' Garden		China R. Int.	M-F D	World Briefing*		BBCWS(am)(eu)(eas		News Summary
1330 R. Swei	eden	2	In Touch with Stockholm (1st wk.)		R. Australia	D	News News		BBCWS(me)(af)	A D	News News
<b>Sport</b> 1310 R. Aust	tralia	M-F	Sport (daily report)	1530	R. Canada Int. BBCWS(eu)	S/A M-F	News British News		R. Australia	D	News
1330 China F 1345 R. Swei	R. Int.	T M	Sports World Sportscan		Events Magazines/F				Events Magazines/l BBCWS(am)(eu)(eas		Europe Today
045 K. 5W0					BBCWS(me)	M-F	Outlook (topical magazine)			) m-i	Europe roddy
Newscasts (*ex	xtended)		- Page 50 Freqs		BBCWS(af) R. Australia	M-F M-F	Focus on Africa Asia Pacific		ess/Finance BBCWS(am)(eu)(eas	s) M-F	World Business Report
	S(am)(eu)(wcaf S(me)(esaf)(eas		News S/A News	1510	R. Canada Int. China R. Int.	S S	The Sunday Edition (from 1310) Report on Developing Countries	Arts an	d Culture		
	S(me)(esaf)	M-F D	World Briefing* News			M-F A	Current Affairs Global Review		BBCWS(me)(af)	T H	Meridian-Screen (film/cinema) Meridian-Writing (books)
R. Aust	tralia	D	News		R. Austria Int.	D	Report from Austria	1630	BBCWS(af)	H	Artheat
R. Cano R. Japa	ada Int. on	D D	News News	1545	BBCWS(eu)	M/T/H W	Analysis From Our Own Correspondent				
1430 BBCWS	S(me)(esaf)(eas	s)	M-F British News			F	Analysis (exc. last wk.)		Lives and Views R. Australia	S	The National Interest
Current Affairs 1400 BBCWS		eatures M-F	Fact Asia Tadan		ss/Finance China R. Int.	W	China Horizons		n. nosnana	T W	The Comfort Zone (homes/gardens/food) Verbatim (oral histories)
1400 BBCW3		S	East Asia Today The Sunday Edition (from 1310)							Н	Hindsight (history)
1410 China F	R. Int.	M-F S	This Morning (from 1210) Report on Developing Countries		/Technology (incl. H BBCWS(am)	lealth & I M	invironment) One Planet (ecology)	1630	BBCWS(af)	F W	Awaye! (Aboriginal culture) Talkabout Africa
		M-F A	Current Affairs Global Review		. ,	T W	Discovery (research) Health Matters		R. Australia	W	Earshot (Australian voices)
1415 R. Japa	חכ	M-F	44 Minutes		D C 1 1 :	Н	Science View		ational Features		Omethor (dec. )
Business/Econ					R. Canada Int. R. Australia	A M	Quirks and Quarks The Health Report		BBCWS(me)(af) BBCWS(af)	F T	Omnibus (documentary) The Story of Africa
1420 BBCWS China F	S(me)(esaf)	M-F W	World Business Report China Horizons		BBCWS(me)	F	Body and Mind (health)	Music			
					d Culture	т	Harting Course (fil. 1)		BBCWS(me)	W	Meridian-Masterpiece*
<b>Science/Techno</b> 405 BBCWS	<b>ology (incl. He</b> S(eu)(wcaf)	alth & E	Discovery	1505	BBCWS(eas)	T H	Meridian-Screen (film/cinema) Meridian-Writing (books)		R. Australia	W A	Meridian-Music Melisma (from 1505)
		T W	Health Matters Science View	1520	China R. Int.	S	In the Spotlight	1630	BBCWS(me)(af)	M T	Music Mix* UK Top 20
		F	One Planet (ecology)							H	World of Music

1645	BBCWS(me)(af)	W	UK Album Chart Musir X-Press
(*may	be preempted for Prom		Moster 11000
Enterta	inment/Variety, Maga	zine Sho	ws
	R. Australia BBCWS(me)	M W/F	Margaret Throsby Interview Westway (drama serial)
Sport 1605	BBCWS(all)	S A	Sunday Sportsworld Sportsworld (from 1405)
1630 1645	BBC(af) BBCWS(am)(eu)(eas)	M/F	Fast Track Sports Roundup
in this i		t inclusior refer to tl	<b>&gt;-2100 UTC</b> of the BBC World Service schedules for these hours he July issue of <i>MT</i> which does have these schedules
Newsc		UTC	- Page 54 Freqs
2100		)D	News D News
2120	BBCWS(am)(eu)	M-A	British News
<b>Current</b> 2110 2145	<b>Events Magazines/Fe</b> R. Australia BBCWS(am)	atures S-H M/T/H/ W	AM (morning news magazine) F Analysis From Our Own Correspondent
Busine	ss/Finance		

Science	Technology (incl.	Health &	Environment)
2105	BBCWS(wcaf)	M	Health Matters
		T	Science View
		Н	One Planet (ecology)
		F	Discovery

M-F

Global Business

World Business Review

World Business Report

2130	R. Australia	A M T	Science in Action Health Report Innovations
	ives and Views BBCWS(am)	M-F	Caribbean Report*

2105	BBCWS(am)	M-F	Caribbean Report*
	R. Australia	Α	Australia All Overf
2130	BBCWS(am)	T/F	Calling the Falklands
	BBCWS(wcaf)	Α	People and Politics
	R. Australia	Н	Rural Reporter
2145	BBCWS(am)	Α	Letter from America
(*speci	al service on 5975	5, 11675,	15390 kHz. only.)
( ^ spe	ecial service on 59	75, 11680	) kHz.

Inform	ational	<b>Features</b>
2130	RRCW	IC(am)

2130 BBCWS(eu)

2105 BBCWS(am)

BBCWS(am)(eu)

		T	Focus on Faith
		Н	People and Places
		F	Essential Guide
	R. Australia	S	Educational series
		W	Religion Report
2145	BBCWS(am)	S	Reporting Religion

# R. Australia

Entertainment/Variety, Magazine Shows					
2105	BBCWS(wcaf)	S	Wright Around the World (pop requests)		
2130	BBCWS(eu)	S	Panel game or Quiz		
	BBCWS(wcaf)	W	Pick of the World (BBC's best)		
2145	BBCWS(eu)	M-F	Off the Shelf (readings)		

Everywoman

Composer of the Month

Sports International

Jazz Notes

# Listener Contact/Interactive

2105	K. Australia	ŀ	reedback
C			

# Sport 2105 BBCWS(wcaf) 2130 BBCWS(am) Sports Roundup

			- rege or rive
Newsco	ists (*extended)		
2200	BBCWS(am)	D	The World Today*
	BBCWS(wcaf)	D	News
	R. Australia	D	News
	R. Canada Int.	M-F	World at Six*
2220	D. Vlaandoron Int	AA E	Moure

Correin	evenis magazine	ZA LAGIOIA2	
2200	R. Canada Int.	S/A	The World This Weekend
2205	BBCWS(wcaf)	M-F	Outlook (topical magazine)
2210	R. Australia	S-H	AM (morning news magazine)

2230	BBCWS(am) BBCWS(am)(wcaf) R. Canada Int.	F A S A M-F	Asia Pacific Correspondents' Report Agenda (trends) From Our Own Correspondent As It Happens (interviews)
	R. Vlaanderen Int.	M	Focus on Europe
	R. Vlaanderen Int.	H	International Report

Business/Finance 2243 R. Vlaanderen Int. H Economics

# Science/Technology (incl. Health & Environment)

2243	R. Vlaanderen Int.	T	Green Society (ecology)
2245	BBCWS(wcaf)	F	Body and Mind

### Arts and Culture 2243 R. Vlaanderen Int. W/F

Local Lives and Views						
2230	BBCWS(am)	F	People and Politics			
2234	R. Vlaanderen Int.	M-F	Belgium Today			
2238	R. Vlaanderen Int.	S	Tourism in Flanders			
		M-F	Press Review			
2248	R. Vlaanderen Int.	W	Around Town			
		F	Tourism in Flanders			

Inform	ational Features		
2205	BBCWS(wcaf)	Α	0mi

203	DDC113(WCu1)		Ollillibus (documentary)
245	BBCWS(wcaf)	M	Patterns of Faith
		T	A Radio History of the World
		W	Heart and Soul (religion)

lusic			
230	BBCWS(wcaf)	S	Wo
	R Vlaanderen Int	Δ	Mil

WOSIC			
2230	BBCWS(wcaf)	S	World of Music
	R. Vlaanderen Int.	Α	Music from Flanders
2240	R. Australia	S	Australian Music Show (rock)
		M/H	Music Deli (international)
		T	Blacktracker (Aboriginal contemporary)
		W	Australian Country Style
2254	R. Vlaanderen Int.	S-F	Soundbox

Enterta	inment/Variety,	Magazine Sho	WS
2205	BBCWS(wcaf)	S	Panel game or Quiz
2230	R. Canada Int.	Α	Summer Comedy Special
2245	RRCWS(wcnf)	Н	Rest of "The Edge" (youth culture)

#### SWL. Media and Communications

2230	R.	Vlaanderen	Int.	S	Radio World
------	----	------------	------	---	-------------

FI310HO	u	miucy imeru	CIIVE			
2244	R.	Vlaanderen I	nt.	S	Brussels	1043

Jpon			
2230	R. Canada Int.	S	Inside Track (anthologies)
2248	R. Vlaanderen Int.	M	Sports

### 2300 UTC Page 55 Freqs

Newsco	ists (*extended)		
	BBCWS(am)	S	The World Today*
		M-F	News
		Α	News Summary
	BBCWS(eas)	D	The World Today
	China R. Int.	D	News
	R. Australia	D	News
	R. Canada Int.	News	
2330	R. Netherlands	S/A	News

## **Current Events Magazines/Features**

2305	BBCWS(am)	M-F	Outlook
	R. Canada Int.	M-F	As It Happens (from 2230)
2310	China R. Int.	S-H	Current Affairs
		F	Global Review
		Α	Report on Developing Countries
	R. Australia	S-H	Asia Pacific
	R. Netherlands	M-F	Newsline
2330	R. Canada Int.	W	Dispatches
2355	R. Netherlands	F	Insight (commentary)

# Business/Economics

China R. Int.	T	China Horizons
R. Australia	M	Innovations

Science/Technology	(incl	Health	ጸ	Environment)

Jeionico	rociniology (mei.	mounn or	LITTIONING
2305	R. Australia	Α	Ockham's Razor (opinion)
	R. Canada Int.	Α	Quirks and Quarks
2330	R. Australia	S	Earthbeat (ecology)
	BBCWS(eas)	F	Global Business

# Arts and Culture

2320	China K. Int.	A	In the Spotlight
2330	R. Australia	T	Arts Talk
	BBCWS(eas)	Α	Arts in Action
2345	BBCWS(am)	F	Just a Taste (food and culture)

Local L	ives and Views		
2330	China R. Int.	S	People in the Know
		Н	Life in China
	R. Australia	W	Rural Reporter (outback)
2335	R. Netherlands	A	Europe Unzipped
Inform	ational Features		
2315	R. Australia	F	Lingua Franca (about language)
2330	China R. Int.	W	Voices from Other Lands
2345	BBCWS(am)	M	Patterns of Faith
	` '	T	Language Steamrollers (tracing "dead" languages)
		W	Heart and Soul (religion)
Music			
2305	R. Canada Int.	S	Global Village (world/folk)
2330	BBCWS(am)	S	Greenfield Collection (classical requests)
	WBCQ(7415kHz)	Α	Fred Flintstone's Music Show
	WWCR(3215kHz)	S	Ken's Country Classics
Enterto	inment/Variety, Mag	azine Sh	nws
	WBCQ(7415kHz)	S	Le Show
	WBCQ(17495kHz)		Marion's Attic (vintage recordings)
2301	BBCWS(am)	A	Play of the Week (radio theatre)
	R. Australia	F	Book Readina
2330	R. Canada Int.	A	Madly Off in All Directions (comedy/satire)
2345	BBCWS(am)	Н	Best of "The Edge" (youth culture)
SWL. A	Nedia and Communica	ıtions	
	R. Australia	Н	The Media Report
	WRCQ(7415kHz)	W	World of Radio

0	R. Australia	Н	The Media Report
	WBCQ(7415kHz)	W	World of Radio
	WHRI(9495 kHz)	Α	Dxing with Cumbr

nzielie	a comacy imeraci	ve	
2320	China R. Int.	F	Listeners' Garden
2335	R. Netherlands	S	Sincerely Yours

Spon			
2330	China R. Int.	M	Sports World
	R. Canada Int.	S	The Inside Track

# New at <u>www.monitoringtimes.com</u>

- · Link list from John Catalano's June fea-
- Baseball Listener's Guide 2001 companion to Ken Reitz's July feature
- Updated freq exchange for Maryland area and others
- More on BBC controversy
- Complete list of NOAA weather stations
- and much more...!

# Thank You ...

# **Additional Contributors to This** Month's Shortwave Guide:

Bob Fraser, Cohasset, MA; Hans Johnson, WY/Ulis Fleming, MD/ Cumbre DX/ BBCM; BBC Harold Sellers, DX Ontario; Hard Core DX; Radio Sweden/Media Scan; Robert E. Thomas, Bridgeport, CT; Usenet Newsgroups; Worldwide DX Club.

# All Frequencies MHz

# **Satelites Mexicanos Solidaridad 2**

C-Band -	113 degi	ees West longitude
1N(V)	3720	Data Transmissions
1W/L(H)	3740	Data Transmissions
2N(V)	3760	Data Transmissions
1W/U(H)	3780	Data Transmissions
3N(V)	3800	Data Transmissions
2W/L(H)	3820	Data Transmissions
4N(V)	3840	Data Transmissions
2W/U(H)	3860	Data Transmissions
5N(V)	3880	(none)
3W/L(H)	3900	Data Transmissions
6N(V)	3920	Data Transmissions
3W/U(H)	3940	Data Transmissions
7N(V)	3960	(none)
4W/L(H)	3980	Data Transmissions
8N(V)	4000	Data Transmissions
4W/U(H)	4020	Data Transmissions
9N(V)	4040	Data Transmissions
5W/L(H)	4060	Data Transmissions
10N(V)	4080	Data Transmissions
5W/U(H)	4100	Data Transmissions
11N(V)	4120	(none)
6W/L(H)	4140	Data Transmissions
12N(V)	4160	Data Transmissions
6W/U(H)	4180	Data Transmissions

# Satelites Mexicanos Solidaridad 2

Ku-band -	113 degr	ees West longitude
T01(H)	11730	Sky Mexico DBS (digital)
T02(H)	11791	Sky Mexico DBS (digital)
T03(H)	11852	Sky Mexico DBS (digital)
T04(H)	11913	Sky Mexico DBS (digital)
T05(H)	11974	Data Transmissions
T06(H)	12035	Sky Mexico DBS (digital)
T07(H)	12096	Sky Mexico DBS (digital)
T08(H)	12157	Sky Mexico DBS (digital)
T09(V)	11743	Sky Mexico DBS (digital)
T10(V)	11804	Sky Mexico DBS (digital)
T11(V)	11865	Data Transmissions
T12(V)	11926	Data Transmissions
T13(V)	11987	Data Transmissions
T14(V)	12048	Sky Mexico DBS (digital)
T15(V)	12109	Sky Mexico DBS (digital)
T16(V)	12170	Sky Mexico DBS (digital)

**Satelites Mexicanos SATMEX-5** 

C-band -	116.8 deg	rees West longitude
1(V)	3720	Data Transmissions
2(H)	3740	Data Transmissions
3(V)	3760	Data Transmissions
4(H)	3780	Data Transmissions
5(V)	3800	(none)
6(H)	3820	Data Transmissions
7(V)	3840	Data Transmissions
8(H)	3860	Data Transmissions
9(V)	3880	Data Transmissions
10(H)	3900	Data Transmissions
11(V)	3920	Data Transmissions
12(H)	3940	Data Transmissions
13(V)	3960	TV Azteca (digital)
14(H)	3980	Data Transmissions
15(V)	4000	Data Transmissions
16(H)	4020	PCTV - Television Por Cable
		(digital)
17(V)	4040	Data Transmissions
18(H)	4060	Mexican Government and Leg-
		islative channels, XEIMT-TV 22,
		XEIPN-TV 11 (digital)
19(V)	4080	Data Transmissions
20(H)	4100	Data Transmissions
21(V)	4120	Data Transmissions

22(H)	4140	Data Transmissions
23(V)	4160	Data Transmissions
24(H)	4180	Edusat (digital)

# **Satelites Mexicanos SATMEX-5**

Ku-Band -	116.8 de	egrees West longitude
1(H)	11720	Data Transmissions
2(V)	11740	(none)
3(H)	11760	Data Transmissions
4(V)	11780	(none)
5(H)	11800	Data Transmissions
6(V)	11820	(none)
7(H)	11840	Data Transmissions
8(V)	11860	(none)
9(H)	11880	Data Transmissions
10(V)	11900	Data Transmissions
11(H)	11920	Data Transmissions
12(V)	11940	Data Transmissions
13(H)	11960	Data Transmissions
14(V)	11980	Data Transmissions
15(H)	12000	Data Transmissions
16(V)	12020	Data Transmissions
17(H)	12040	Data Transmissions
18(V)	12060	Data Transmissions
19(H)	12080	CTN, CCTV-4, MSTV (digital)/
		Data Transmissions
20(V)	12100	Data Transmissions
21(H)	12120	Data Transmissions
22(V)	12140	Data Transmissions
23(H)	12160	(none)
24(V)	12180	Data Transmissions

# Telesat Canada Anik E1

C-Band -	118.7 de	grees West longitude
1A(H)	3720	(none)
1B(V)	3740	(none)
2A(H)	3760	(none)
2B(V)	3780	(none)
3A(H)	3800	(none)
3B(V)	3820	(none)
4A(H)	3840	(none)
4B(V)	3860	(none)
5A(H)	3880	(none)

5B(V)	3900	(none)
6A(H)	3920	(none)
6B(V)	3940	(none)
7A(H)	3960	(none)
7B(V)	3980	Telesat Canada ID slate (occa-
		sional)
8A(H)	4000	(none)
8B(V)	4020	(none)
9A(H)	4040	(none)
9B(V)	4060	(none)
10A(H)	4080	(none)
10B(V)	4100	(none)
11A(H)	4120	(none)
11B(V)	4140	(none)
12A(H)	4160	(none)
12B(V)	4180	(none)

## Telesat Canada Anik E1

Ku-Band - 118.7 degrees West longitude

T01(V)	11717	(none)
T02(V)	11743	(none)
T03(V)	11778	(none)
T04(V)	11804	(none)
T05(V)	11839	(none)
T06(V)	11865	(none)
T07(V)	11900	(none)
T08(V)	11926	(none)
T09(V)	11961	(none)
T10(V)	11987	(none)
T11(V)	12022	(none)
T12(V)	12048	(none)
T13(V)	12083	(none)
T14(V)	12109	(none)
T15(V)	12144	(none)
T16(V)	12170	(none)
T17(H)	11730	(none)
T18(H)	11756	(none)
T19(H)	11791	(none)
T20(H)	11817	(none)
T21(H)	11852	(none)
T22(H)	11878	(none)
T23(H)	11913	(none)
T24(H)	11939	(none)
T25(H)	11974	(none)
T26(H)	12000	Data Transmissions

12035	(none)
12061	(none)
12096	Data Transmissions
12122	Data Transmissions
12157	(none)
12183	(none)
	12061 12096 12122 12157

# **Satelites Mexicanos Morelos 2**

C-Band -	120 degr	ees West longitude
1W/L(H)	3720	(none)
1N(V)	3740	(none)
1W/U(H)	3760	(none)
2N(V)	3780	Data Transmissions
2W/L(H)	3800	(none)
3N(V)	3820	(none)
2W/U(H)	3840	(none)
4N(V)	3860	Data Transmissions
3W/L(H)	3880	(none)
5N(V)	3900	Data Transmissions
3W/U(H)	3920	(none)
6N(V)	3940	(none)
4W/L(H)	3960	(none)
7N(V)	3980	(none)
4W/U(H)	4000	(none)
8N(V)	4020	Data Transmissions
5W/L(H)	4040	(none)
9N(V)	4060	(none)
5W/U(H)	4080	(none)
10N(V)	4100	(none)
6W/L(H)	4120	(none)
11N(V)	4140	(none)
6W/U(H)	4160	(none)
12N(V)	4180	(none)

## **Satelites Mexicanos Morelos 2**

Ku-Band	- 120 deg	rees West	longitud
T01K(H)	11764	(none)	-
T02K(H)	11888	(none)	
T03K(H)	12012	(none)	
T04K(H)	12136	(none)	
. ,		. ,	

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# **Images from NOAA-16**

ust occasionally we may notice an interesting cloud formation, or other feature in the sky, and then find that a weather satellite (WXSAT) is going to pass high enough overhead to provide an image "from the other side." This happened to Dick Mobley when he noticed two jet contrails from his window, at the same time that NOAA-16 was passing over Anchorage. Close examination of figure 1 shows two aircraft condensation trails (contrails) converging towards the northwest. Dick kindly sent me both the visible-light (channel 2) image and an infrared (channel 5) the latter is reproduced here because it shows the trails more clearly.

My thanks to Dick for an interesting set of high resolution picture telemetry (HRPT) images.



Fig 1: view from above - NOAA-16 May 28, 2001, channel 5 at 2245 UTC from Dick Mobley

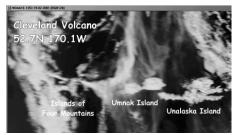


Fig 2: Cleveland volcano in action in February - NOAA-16 image from Dick Mobley

NOAA-16 has continued to provide good quality HRPT but cannot now transmit APT (automatic picture telemetry) due, apparently, to a faulty switch. NOAA reports that the fault is unlikely to be rectifiable. My own HRPT reception system failed in March when a gust of wind blew the dish over, despite the feet of the mount having been weighed down with heavy paving slabs. The broken motor went back to the supplier but has yet to be repaired.

# GOES-2 goes to satellite

Space in geostationary orbit (the Clarke belt) is valuable, being occupied by WXSATs, communication, military and television relay satellites, so when an occupant of that orbit is declared non-functioning, it is boosted to the "graveyard" orbit, some 185 miles above the 22,300 mile high Clarke belt. This was the fate of the elderly WXSAT GOES-2 during early May, after some 24 years of operations.

Officials decided to take the satellite out of commission because of the lack of propellant for future thruster firings. It is preferred to foresee any possible fuel problems ahead of time in order to allow the opportunity to raise the craft's orbit out of the geostationary belt. This also permits the depletion of onboard fuel in order to minimize the risk of future explosions.

Six thruster firings were performed for the orbit transfer, commanded from the Kokee Park Geophysical Observatory station in Hawaii. Launched aboard a Delta rocket in June 1977, GOES-2 was the second component of NOAA's Geostationary Operational Environmental Satellite system. Until 1993, the satellite provided weather sensing information to forecasters on the ground, allowing them to make more informed and more accurate forecasts. After a brief two-year stand-down, the craft was brought to life again as a relay satellite for the National Science Foundation to broadcast their transmissions from the South Pole to public broadcasting stations around the U.S.

# Polar WXSAT operations

Meteor 3-5 resumed transmissions during May, and Meteor 2-21 was switched off

around the same time. The images that I have received since then appear to have slightly lower noise levels. Images appear to show more of the eastern regions than I have recorded before. If you have an antenna with easy access, you may find that testing reception after changing the antenna's angle of elevation produces significantly different results. Some years ago I tilted my crossed-dipole to 45° to the horizon, and found much better reception near the limits of the satellite's rising or setting. I subsequently bought another antenna and feed so that I could choose the preferred characteristics for any selected pass!

Since the new synchronization regime was brought in for NOAA-15 (occurring at 0730 UTC each day) APT images have improved.

# GOES-M launch

The newest geostationary WXSAT (GOES-M) is ready at Astrotech, Titusville, where the media were able to see the last in the current series of advanced geostationary weather satellites in service. GOES-M has a new instrument not on earlier spacecraft: a Solar X-ray Imager that can be used in forecasting space weather – the effects of solar storms that create electromagnetic disturbances on earth and affect other satellites, communications and power grids. GOES is scheduled to launch from Cape Canaveral Air Force Station on an Atlas II rocket on July 15, 2001, due to a delay in the shipment of a booster rocket and the Shuttle launch on July 12.

The latest launch information is normally available on this site:

http://www.osd.noaa.gov/news/

## **Frequencies**

NOAA-14 transmits APT on 137.62 MHz NOAA-15 and NOAA-12 transmit APT on 137.50 MHz Meteor 3-5 may transmit APT on 137.30 MHz when in sunlight

Resurs 1-4 transmits APT on 137.85 MHz

Okean-0, Okean-4 and Sich-1 sometimes transmit APT briefly on

GOES-8 and GOES-10 use 1691 MHz for WEFAX

FCI Schuylkill (Minersville), PA

larry@grove-ent.com

# Federal Bureau of Prisons (FBOP)

he Federal Bureau of Prisons (FBOP) was established in 1930 to provide more progressive and humane care for Federal inmates, to professionalize the prison service, and to ensure consistent and centralized administration of the 11 Federal prisons in operation

Today, the Bureau falls under the Department of Justice and consists of 98 institutions, six regional offices, a Central Office (headquarters), three staff training centers, and 28 community corrections offices. The regional offices and the Central Office provide administrative oversight and support to the institutions and community corrections offices. Community corrections offices oversee community corrections centers and home confinement programs.

The Bureau is responsible for the custody and care of approximately 148,000 Federal offenders. Approximately 126,000 of these inmates are confined in Bureau-operated correctional institutions or detention centers. The remainder are confined through agreements with State and local governments and through contracts with privatelyoperated community corrections centers, detention centers, prisons, and juvenile facilities.

The Federal prison system is a nationwide system of prisons and detention facilities for the incarceration of inmates who have been sentenced to imprisonment for Federal crimes and for the detention of individuals awaiting trial or sentencing in Federal court. In the United States, there are also 50 State correctional systems and a correctional system for the District of Columbia. These systems are responsible for the imprisonment and detention of offenders who have been sentenced or are awaiting trial for crimes committed within their jurisdictions.

In 1997, Congress passed a law requiring the Bureau of Prisons to assume responsibility for incarcerating the District of Columbia's sentenced felon inmate population by the end of 2001.

# FBOP VHF Frequencies

For many years the Bureau of Prison has used a well-known set of VHF-high band frequencies. These FBOP/FCI (Federal Correctional Institute) frequencies and callsigns are as follows:

Nationwide: 170.650 170.875 170.925 Discrete Frequencies: 162.025 163.000 164.100 165.4125 165.825 165.875 165.925 166.275 168.425 168.825 168.925 169.050 170.000 170.350 170.550 170.600 170.625 171.175 171.2625 171.500 171.975 172.250 172.575 172.625 173.050 173.125 173.6125 173.7375 173.7875 173.8375 173.8625 173.9625

C-11-1	
<u>Callsigns</u> :	500 D TV
KFQ 252	FPC Bryan, TX
KFQ 254	FPC Pensacola, FL
KFQ 256	FPC Yankton, SD
KFQ 257	FCI Jesup, GA
KFQ 258	FCI Manchester, KY
KFQ 259	FCI Three Rivers, TX
KOE 951	FCI Morgantown, WV
KOE 952	FCI Memphis, TN
KOE 954	FCI Terminal Island, CA
<b>KOE 955</b>	FCI Safford, AZ
<b>KOE 956</b>	FCI Lompoc, CA
KOE 957	FCI La Tuna, TX
KOE 958	FPC Eglin AFB, FL
KOE 959	USP Marion, IL
KOE 960	Central Office Washington, DC
KOE 961	MDC Brooklyn, NY
KOE 962	USP Lewisburg, PA
KOE 963	FCI/FPC/USP Allenwood, PA
KOE 964	FCI Danbury, CT
KOE 965	FCI Petersburg, VA
KOE 966	FCI Ashland, KY
KOE 967	USP Atlanta, GA
<b>KOE 968</b>	FCI Tallahassee, FL
<b>KOE 969</b>	FPC Montgomery, AL
<b>KOE 970</b>	FCI/FDC/MCC Miami, FL
KOE 971	USP Terre Haute, IN
KOE 972	FPC Alderson, WV
KOE 973	FCI Texarkana, AR
KOE 974	FCI El Reno, OK
KOE 975	FCI Sandstone, MN
<b>KOE 976</b>	FCI/FMC Butner, NC
<b>KOE 977</b>	FCI Seagoville, TX
KOE 978	FCI Englewood, CO
KOE 979	FCI Milan, MI
KOE 980	FCI Bastrop, TX
KOE 981	USP Leavenworth, KS
KOE 982	MCFP Springfield, MO
KOE 983	FMC Carswell (Fort Worth), TX
KVL 310	FCI Oxford, WI
KVL 311	FMC Lexington, KY
KVL 312	MCC Chicago, IL MCC New York City, NY
KVL 313	MCC New York City, NY
KVL 315	MCC San Diego, CA
KVL 316	FCI Talladega, AL
KVL 318	FCI Big Spring, TX
KVL 319	FCI Otisville, NY
KVL 320	FDC Philadelphia, PA
	FCI Tucson, AZ
KVL 321	
KVL 322	FCI Phoenix, AZ
KVL 323	FMC Rochester, MN
KVL 324	FCI/FDC Oakdale, LA
KVL 325	FCI Marianna, FL
KVL 326	FCI Fairton, NJ
K/L 020	AADC Las Assalas CA

MDC Los Angeles, CA

FCI Sheridan, OR

KVL 331 KVL 334	FPC Nellis AFB, NV FBOP Staff Training Academy Glynco, GA
<u>Key</u> :	
FCI	Federal Correction Institute
FDC	Federal Detention Center
FMC	Federal Medical Center
FPC	Federal Prisons Camp
MCC	Metropolitan Corrections Center
MCFP	Medical Center for Federal Prisoners
MDC	Metropolitan Detention Center
USP	U.S. Penitentiary

**KVL 330** 

# FBOP Communications Upgraded

In 1996, the federal government wanted a way for agencies to purchase Motorola mobile/ portable radios with trunking and encryption capabilities. The U.S. Army Communications-Electronics Command special project office located at Fort Monmouth, NJ, became the agent for a large contract known as BSTRS (Base Support Trunked Radio System) which accomplished the goal of putting trunk systems on the air. And, according to the BSTRS website, one of the government agencies that has bought systems under this contract was the Federal Bureau

We have received a few reports from the field on FBOP trunk systems in the 406-420 MHz federal land mobile band. The information below represents all of the current information known to this point about the Bureau of Prisons trunk systems. If the FBOP facility near you isn't on the list we would appreciate scanner owners searching in the 406-420 MHz range for trunk activity. Additions, corrections, and updates are always appreciated.

# **BUREAU OF PRISONS TRUNK SYSTEMS**

U.S. Penitentiary - Florence, Colorado Frequencies: 406.550 408.300 408.350 408.550 409.150 409.550 409.950

Federal Correctional Institute - Miami, Florida

Frequencies: 406.550 408.950 409.350 409.750

Federal Correctional Institute - Greenville, Illinois

**KVL 328** 

KVL 329

Frequencies: 406.350 407.150 407.950 408.750 409.150

Federal Correctional Institute - Pekin, Illinois
Frequencies: 406.350 407.150 407.950 408.750 409.150

**U.S. Penitentiary - Terre Haute, Indiana** Frequencies: 406.350 407.150 407.950 408.750

Federal Correctional Institute - Manchester, Kentucky

Frequencies: 406.750 407.550 408.350 409.150 409.950

Federal Correctional Institute Cumberland, Maryland

Frequencies: 406.350 409.150 409.350 409.550 409.750

Federal Correctional Institute - Fort Devens/Ayers, Massachusetts

System: Motorola Type II (System ID 6046) Frequencies: 406.950 408.350 408.550 408.950

Federal Correctional Institute - Butner, North Carolina

Frequencies: 406.350 406.550 406.750 407.150 407.950 408.150 408.350 408.750 409.150 409.950

Federal Correctional Institute - Fort Dix, New Jersey

Frequencies: 407.950 408.225 408.750 409.425 412.425 413.650

Metropolitan Detention Center - Brooklyn, New York

Frequencies: 407.950 408.550 408.750 409.750

Will Rogers Airport - Oklahoma City, OK Frequencies: 407.950

Federal Correctional Institute/U.S. Penitentiary - Allenwood, Pennsylvania

Frequencies: 406.350 406.750 406.950 407.150 407.950 408.350 408.750 408.950 409.550 409.950

Federal Correctional Institute - Schuylkill (Minersville), Pennsylvania

Frequencies: 406.550 408.550 409.150 409.250 409.350 409.750

Federal Correctional Institute - Estill, South Carolina

Frequencies: 406.350 407.150 407.950 408.750 409.550

Federal Correctional Institute - Fort Worth,

Frequencies: 408.350 411.175 412.425 413.650

And that is it for this month's edition of *The Fed Files*. We will complete our promised Coast Guard VHF/UHF frequency list in the September issue of *MT*. But now it is time to look at this month's federal spectrum scan in Table One. In this issue we continue our detailed look at the reorganized 406-420 MHz UHF federal land mobile service. 73 and good hunting.

# Table One: Federal UHF Land Mobile Service

	<b>Ch/Paired Freq</b> 72/407.0000	Agencies Air Force, Energy Department, Justice De- partment (Nationwide), NASA, TVA, Veter-	416.5500	116/407.5500	Federal Trunk Group 4 (paired with 408.5500): Air Force, Army, Bureau of Pris- ons, Coast Guard, Energy Department
/14 N125	73/407.0125	ans Administration (No reported activity)			NASA, National Park Service, Navy, Socia Security Administration
	74/407.0123	Air Force, Energy Department, Bureau of	416.5625	117/407.5625	(No reported activity)
	,,	Indian Affairs, Bureau of Mines, Bureau of Reclamation, General Services Administra- tion, Interior Department (Nationwide), Na-		118/407.5750	Army, Bureau of Reclamation, Coast Guard Corps of Engineers, Energy Department, FAA Navy
		tional Park Service, Navy	416.5875	119/407.5875	Coast Guard
	75/407.0375	(No reported activity)	416.6000	120/407.6000	Army, Coast Guard, Energy Department
116.0500	76/407.0500	Drug Enforcement Administration (Nation-	A17 (10E	121/407 / 125	Railroad Transportation Test Center
		wide repeater input to 418.625) < chan- nel 1>		121/407.6125 122/407.6250	US Information Agency Army, Energy Department, FAA
116.0625	77/407.0625	(No reported activity)		123/407.6375	Coast Guard
16.0750	78/407.0750	Army, Energy Department, Interior Department (Nationwide), National Park Service,		124/407.6500	Army, Corps of Engineers, Energy Department
1 / 0075	70/407 0075	Post Office, TVA, Veterans Administration		125/407.6625	Energy Department
	79/407.0875 80/407.1000	(No reported activity) Air Force, Army, Drug Enforcement Admin-	416.6/50	126/407.6750	Bureau of Reclamation, Corps of Engineers Energy Department, Navy
110.1000	00/ 107.1000	istration, Energy Department, EPA, FBI,	416.6875	127/407.6875	Energy Department, US Information Agence
		Federal Reserve System, Navy, Post Office,	416.7000	128/407.7000	Army, Bureau of Reclamation, Coast Guard
11/1105	01/407 1106	Veterans Administration	A17 710E	129/407.7125	Energy Department, NASA, Navy Coast Guard, Corps of Engineers, Energ
	81/407.1125 82/407.1250	(No reported activity) Bureau of Land Management, FBI, Interior	410./123	129/407./125	Department
110.1230	02/ 107.1230	Department (Nationwide), National Park	416.7250	130/407.7250	Army, National Park Service, Navy
		Service		131/407.7375	(No reported activity)
	83/407.1375	(No reported activity)	416.7500	132/407.7500	Federal Trunk Group 1 (paired wit
416.1500	84/407.1500	Federal Trunk Group 3 (paired with 407.3500): Air Force, Army, Bureau of Pris-			407.9500): Air Force, Army, Bureau of Prisons, Energy Department, NASA, Navy, Sc
		ons, Drug Enforcement Administration, En-			cial Security Administration
	05/4073/05	ergy Department, NASA, Navy		133/407.7625	(No reported activity)
	85/407.1625 86/407.1750	(No reported activity)	416.//50	134/407.7750	Post Office (Nationwide-Postal Securit
	87/407.1750	Air Force, NOAA (No reported activity)	416 7875	135/407.7875	Police repeater input to 418.300 output) (No reported activity)
	88/407.2000	Drug Enforcement Administration (Nation-	416.7906	103, 107.7.073	Low power, non-voice 5 kHz bandwidt
		wide repeater input to 418.950) < chan-			splinter frequency (416.790625) [unt
114 2125	89/407.2125	nel 6>, Energy Department (Nationwide) (No reported activity)	416.7937		December 31, 2004] Low power, non-voice 5-10 kHz bandwidt
	90/407.2123	Army, Coast Guard (Nationwide), Energy	410./73/		splinter frequency (416.793750) [unt
	,	Department, Federal Highway Administra-			December 31, 2004]
41 / 0075	03.4407.0075	tion, Navy, Post Office	416.7968		Low power, non-voice 5 kHz bandwidt
	91/407.2375	(No reported activity) Energy Department (Nationwide)			splinter frequency (416.796875) [until De
	92/407.2500 93/407.2625	(No reported activity)	416 8000	136/407.8000	cember 31, 2004] IRS (Nationwide), NASA
	94/407.2750	Air Force, Commerce Department, Drug	416.8031	100, 107.0000	Low power, non-voice 5 kHz bandwidt
41 / 0075	05/407.0075	Enforcement Administration			splinter frequency (416.803125) [until De
	95/407.2875 96/407.3000	(No reported activity) Energy Department (Nationwide), Navy,	416.8062		cember 31, 2004] Low power, non-voice 5-10 kHz bandwidt
110.0000	70/ 407.0000	Veterans Administration	T10.000Z		splinter frequency (416.806250) [until De
	97/407.3125	(No reported activity)			cember 31, 2004]
416.3250	98/407.3250	Drug Enforcement Administration (Nation-	416.8093		Low power, non-voice 5 kHz bandwidt
		wide repeater input to 418.900) < chan- nel 2>			splinter frequency (416.809375) [until December 31, 2004]
116.3375	99/407.3375	(No reported activity)	416.8125	137/407.8125	(No reported activity)
416.3500	100/407.3500	Federal Trunk Group 2 (paired with		138/407.8250	(No reported activity)
		408.3500): Air Force, Army, Bureau of Prisons, Energy Department (Nationwide),		139/407.8375 140/407.8500	(No reported activity) Coast Guard (Nationwide), Energy Depart
		NASA, Navy	410.0300	140/407.0300	ment, Forest Service, Navy, Post Office, Trans
	101/407.3625	(No reported activity)			portation Department
416.3750	102/407.3750	National Weather Service (National NOAA		141/407.8625	(No reported activity)
116 3875	103/407.3875	weather radio links) Coast Guard		142/407.8750 143/407.8875	FAA (Nationwide), NOAA (No reported activity)
	104/407.4000	Energy Department		144/407.9000	Environmental Research Lab, National Bu
	105/407.4125	(No reported activity)		,	reau of Standards (Nationwide), Nationa
416.4250	106/407.4250	Air Force, Army, Bureau of Prisons, Energy	41 / 0100	145/407 0105	Ocean Service, NOAA
		Department, FAA, GSA, NASA, Navy, Post Office, State Department, TVA, USIA, Veter-		145/407.9125 146/407.9250	(No reported activity) Coast Guard (Nationwide), Energy Depart
		ans Administration	110.7230	1 10/ 10/1./LJU	ment, Navy, Social Security Administration
	107/407.4375	(No reported activity)	41 / 0===	147/407 05	Transportation Department (Nationwide)
	108/407.4500	Energy Department (Nationwide), Navy		147/407.9375	Coast Guard
	109/407.4625 110/407.4750	(No reported activity) Army, Bureau of Reclamation, Coast Guard,	410.7000	148/407.9500	Federal Trunk Group 3 (paired wit 408.1500): Air Force, Army, Bureau of Pris
		Energy Department, Navy, TVA			ons, Commerce Department (Nationwide)
	111/407.4875	Corps of Engineers			Energy Department, NASA, Navy, Post O
116.5000	112/407.5000	Air Force, Army, Bureau of Reclamation,	<b>114 042</b> F	1/10//107 0/25	(No reported activity)
416 5125	113/407.5125	Energy Department Nationwide), FAA, Navy (No reported activity)		149/407.9625 150/407.9750	(No reported activity) Census Bureau, Center for Disease Contro
	114/407.5250	Government Itinerant: local area, common	110.7730	130/101./130	Energy Department, National Bureau o
		use repeater input (output 407.525)/sim-			Standards, National Weather Service (No
114 5275	115//07 5975	plex (Nationwide)			tionwide-NOAA weather radio links), NOAA
+10.33/5	115/407.5375	Corps of Engineers, Energy Department, Forest Service, US Information Agency	416 9875	151/407.9875	Post Office (No reported activity)
		. 5.551 Solvico, SS Information Agoncy	110.7073	.51, 101.1015	( roportou uchivny)

dan@signalharbor.com

# **The Digital Side of APCO-25**

ore and more public safety radio systems are transitioning from analog to digital service. While these transitions mean that the voice content can no longer be heard, it is often possible to identify talkgroups and other system activity using a trunk-tracking scanner.

Hi

I live in Palm Beach County, Florida, and the county has recently switched to APCO-25 digital radios. All the agencies including the city radios have been switched to digital mode. The county fire and the Sheriff have been placed on the system but in analog mode. With a BC780 will I be able to track these two in analog mode? Thanks for your help.

Mike

The quick answer, Mike, is yes. To understand how analog and digital voice traffic fit together will take some explaining.

In a trunked radio system, the controller uses one of the assigned radio frequencies to continuously transmit data from the repeater out to the radios in the field. This is called the *control channel* and it carries an unending stream of messages for the mobile radios. Each message has a specific, predefined format and communicates such things as background data and system identification, channel grant and channel busy information, and various types of handshaking.

In order to follow a Motorola trunked radio system, a scanner must be able to decode and interpret the messages carried in the control channel

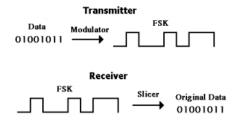
Motorola systems with analog voice channels have a control channel that transmits data at the rate of 3,600 bits per second (bps) using a modulation method known as two-level Frequency Shift Keying (FSK). The repeater transmits one of two frequencies depending on the data fed into it. Bits with a value of '0' are sent as one frequency and bits with a value of '1' are sent as a different frequency. All the receiver has to do is follow the two frequencies to figure out what data bits are being sent.

The simplicity of this signaling method means that the discriminator output of a scanner can be fed into a simple op-amp level comparator (the circuit is commonly called a "data slicer") and the resulting output will be the transmitted stream of bits. The popular "hamcomm" interfaces make use of this principle, and the same idea is used in most trunk-tracking scanners.

Scanners on the market today that follow Motorola systems are designed to decode two-level FSK modulation at 3600 bps and interpret the corresponding messages. As long as the system uses this scheme on the control channel, the scanner will track talkgroup activity.

# Analog and Digital Voice

Radio channels that carry voice traffic can be either analog or digital. Analog traffic on a Motorola system has a sub-audible signal that transfers handshake data between the mobile radio and the repeater while a conversation is in progress.



Digital traffic is typically the output of a

voice encoder-decoder (vocoder). The analog signal from the microphone is compressed and digitized by the vocoder according to a set of procedures. In the case of APCO Project 25 (P-25), these procedures are summa-

rized as Improved Multi-Band Excitation, or IMBE.

IMBE requires a much higher signaling rate in the voice channel than what is used in the standard Motorola control channel. The vocoder converts the voice signal from the microphone into digital data at a rate of 4,400 bps. An additional 2,400 bps worth of signaling information is added, along with 2,800 bps of forward error correction to protect the bits during transmission. The combined channel rate for IMBE in Project 25 radios is 9600 bps, or nearly three times the rate of the control channel. Project 25 specifies a more efficient, but more complicated, modulation method known as C4FM that is very different from the two-level FSK used on the control channel.

P-25 radios are supposed to be backward compatible, meaning they should be able to operate in analog mode with older analog radios

and in digital mode with other P-25 radios. If an agency wants to mix old analog radios with P-25 radios, the system must use a control channel that both types of radios can understand. That means a trunked radio system with analog radios must use a 3600 bps control channel.

Since the control channel is separate from the voice channel, nearly any Motorola system can make use of IMBE radios as long as the 3600 bps control channel is maintained.

# Project 25 Trunking

Project 25 is a set of standards, some mandatory and some optional. One of the optional standards is a specification for digital trunking that is completely different from the method used by Motorola in their analog systems. It uses a 9600 bps control channel and shares the same C4FM modulation method as the digital voice channels. A system that uses Project 25 digital trunking will not interoperate with older analog radios, since the analog radios are unable to decode the 9600 bps C4FM control channel. Fortunately for scanner listeners, there are very few active Project 25 digital trunking systems.

	Analog Unly	Analog and P-25 Digital	P-25 Digital Only
3600 bps control channel	YES	YES	MAYBE
9600 bps control channel	NO	NO	MAYBE
Analog voice	YES	SOME	NO
IMBE voice	NO	SOME	YES

### ASTRO VSELP

To add a little more confusion, Motorola has sold digital systems that use a different type of vocoder, known as Vector Sum Excited Linear Prediction (VSELP). Cleveland, Ohio, and Memphis, Tennessee, are two cities that use VSELP. These systems also use the Motorola 3600 bps control channel but are not interoperable with the digital voice features of APCO-25 radios.

# Palm Beach County, Florida

Now, back to Palm Beach County. The previous VHF system used by the Palm Beach County Sheriff and the conventional (nontrunked) 800 MHz in Boca Raton have been replaced by a 10-site, 26-channel Motorola Smartzone system with Project 25 capability. This will also allow adjacent communities to

talk with each other, as well as with the nearby counties of Broward, Martin, and Miami-Dade.

Boca Raton, Boynton Beach, and Delray Beach made the switch earlier this year. So far Police and Fire department transmissions are IMBE digital, while Public Works are analog.

Frequencies are 856.3125, 856.3375, 857.3125, 857.3375, 858.3125, 858.3375, 859.3125, 859.3375, 860.3125, 860.3375, 866.100, 866.125, 866.325, 866.500, 866.600, 866.625, 866.725, 866.750, 866.250, 866.850, 867.100, 867.325, 867.350, 867.375, 867.400, 867.575, 867.800, 868.225, 868.375, 868.400, 868.650, 868.700, and 868.725 MHz.



If you have web access, Palm Beach County has a live Computer Aided Dispatch (CAD) web page that is updated every two minutes. The address is http://www.co.palmbeach.fl.us/fireapp/fire.asp.

# Wayne County, Michigan

I live in the southern Downriver area of Wayne County, Michigan (near Detroit). I monitor using an Icom IC R7100. Until Tuesday I was monitoring my local police departments (Grosse Ile, Trenton, Woodhaven, Flat Rock and Rock Wood) at 155.6400 MHz. They have disappeared!

I asked a police officer about that and he responded that they have gone to an 800 MHz system with 38 channels. When I checked the FCC data base at your website I can find no 800MHz frequencies listed for Grosse Ile, Trenton, Flat Rock, Michigan. Any suggestions as to what I can do?

Any help you can give me would be appreciated.

A Michigan Scanner

The old Wayne County Downriver Mutual Aid system, callsign WPIU702, has transitioned to a digital system for the municipalities of Allen Park, Brownstown Township, Ecorse, Flat Rock, Gibraltar, Grosse Ile Township, Lincoln Park, Melvindale, River Rouge, Riverview, Romulus, Southgate, Taylor, Trenton, Woodhaven and Wyandotte.

Assigned frequencies are 866.5750, 866.600, 866.625, 866.825, 867.050, 867.125, 867.200, 867.2625, 867.575, 867.775, 867.800, 867.8250, 868.075, 868.100, 868.1250, 868.3375, 868.4875, 868.650, 868.750 and 868.8375 MHz.

Wayne County is also home to an interesting consolidation of police and fire dispatch centers. The cities of Dearborn Heights, Garden City, Inkster, Westland and Wayne have gone in together to share the cost of their new 800 MHz radio system. Each city will pay for their own radios, but will split the \$2 million cost for repeaters and other common equipment. A 300-foot radio tower behind the Westland police station will be the primary repeater site, although Dearborn Heights, Garden City and Wayne will continue to dispatch from their own stations.

The assigned frequencies for the system are 866.550, 866.6125, 866.775, 867.250, 867.550, 867.750, 868.050, 868.1375, 868.1875, 868.5625, 868.775 and 868.800 MHz, but it appears that voice transmissions are digital.

# State of Michigan

At the state level, the Michigan Public Safety Communications System (MPSCS) has completed the third phase of their \$187 million project to replace the old low band VHF radio network with an 800 MHz P-25 digital Motorola system.

Phases one and two provided service to southeast, southwest, and west-central Michigan, including the cities of Detroit, Jackson, Lansing, and Grand Rapids. Phase three completed coverage for the entire lower Peninsula in March, although data services will not be available for another three years. Phase four will cover the Upper Peninsula and finish out the project.

When complete, the state will have 181 towers, each with at least five repeaters and some with as many as twelve. Seven dispatch centers will operate the system from locations in Bridgeport, East Lansing, Gaylord, Negaunee, Northville, Paw Paw and Rockford.

More than 50 public safety agencies and nearly 8,000 radios are currently using the system. Besides local and state agencies, Federal users include the Federal Bureau of Investigation, Secret Service, and Customs Service.

## Scanners in Michigan

As silly as it sounds, a permit is required to have a scanner in a vehicle while in Michigan. Under Michigan law 750.508, having a scanner capable of receiving police frequencies is a misdemeanor punishable by a fine of as much as \$500.00 and up to a year in jail. Unless the car is owned or used by a "peace officer" or a licensed amateur radio operator, you must have a state-issued permit to legally possess such a scanner. Here is the actual text of the law:

Any person who shall equip a vehicle with a radio receiving set that will receive signals sent on frequencies assigned by the Federal Communications Commission of the United States of America for police purposes, or use the same in this state unless such vehicle is used or owned by a peace officer or a bona fide amateur radio operator holding a technician class, general, advanced, or extra class amateur license issued by the federal communications commission, without first securing a permit to do so

from the director of the department of state police upon application as he or she may prescribe, shall be guilty of a misdemeanor, punishable by imprisonment in the county jail for not more than 1 year, or by a fine of not more than \$500.00, or by both fine and imprisonment in the discretion of the court.

An application may be requested by calling (517) 336-6240 or downloaded from the web at http://www.mpscs.com/com-022.pdf.

That's all for this month. I welcome your questions and comments via electronic mail at dan@signalharbor.com, and more information is available at http://www.signalharbor.com. Until next month, happy monitoring!



This huge 472 page Third Edition includes over 770 shortwave and amateur communications receivers made from 1942 to 1997. Here is everything you need to know as a radio collector or informed receiver buyer. Entry information includes: receiver type, date sold, photograph, size & weight, features, reviews, specifications, new & used values, variants, value rating and availability. Ninety eight worldwide manufacturers are represented. 840 Photos. Become an instant receiver expert!



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# **Alphabet Soup**

AS? NM? RWY? TSD? How many times have newcomers to our hobby — and experienced monitors as well — run into acronyms, abbreviations, and other brain bogglers pertaining to monitoring the aero bands? Well, K. Z., a controller from ZJX (Jacksonville Air Route Traffic Control Center) sent us the listing below in order to try to alleviate the confusion ensuing when an abbreviation is used on the air that a monitor doesn't understand. Thanks, Ken!

# Air Traffic Management Glossary of Terms

**AAR** - Airport Acceptance Rate or Airport Arrival Rate; the number of arrivals an airport is capable of accepting each hour.

AC or A/C - Aircraft ADZY - Advisory ARPT - Airport

ARSR - Air Route Surveillance Radar. ARTCC radar used primarily to detect and display an aircraft's position while en route between terminal areas. The ARSR enables controllers to provide radar air traffic control service when aircraft are within the ARSR coverage. In some instances, ARSR may enable an ARTCC to provide terminal radar services similar to, but usually more limited than those provided by a radar approach control.

ARTCC - Air Route Traffic Control Center. A facility established to provide air traffic control service to aircraft operating on IFR flight plans within controlled airspace and principally during the en route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft. There are 21 ARTCCs in the United States. (See table 1.)

ASR - Airport Surveillance Radar. Approach control radar used to detect and display an aircraft's position in the terminal area. ASR provides range and azimuth information, but does not provide elevation data. Coverage of the ASR can extend up to 60 miles.

ATC - Air Traffic Control. A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.

ATCSCC - Air Traffic Control System Command Center.

ATCT - Airport Traffic Control Tower. A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services operating in the vicinity of an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace area regardless of flight plan or

weather conditions (IFR or VFR). A tower may also provide approach control services (radar or nonradar).

CDR - Coded Departure Rules. Predefined routes used to route air traffic around areas of severe weather.

**CERAP** - Center Radar Approach Control. There are three of these facilities in the FAA system. (See table 1.)

CIĠS - Ceilings. The height above the ground of the base of the lowest layer of clouds when over half of the sky is obscured.

**CLSD** - Closed

**EDCT -** Expected Departure Clearance Time. Time issued to a flight to indicate when it can expect to receive departure clearance. EDCTs are issued as part of Traffic Management Programs, such as a Ground Delay Program (GDOP).

**EMRG** - Emergency

**FSM** - Flight Schedule Monitor. A tool used by Air Traffic Management Specialists to monitor air traffic demand at airports.

FSS - Flight Service Station. Air Traffic Facilities which provide pilot briefing, en route communications, and VFR search and rescue services, assist lost aircraft and aircraft in emergency situations, relay ATC clearances, originate Notices to Airmen, broadcast aviation weather and NAS information, receive and process IFR flight plans, and monitor NAVAIDs. In addition, at selected locations, FSSs provide En route Flight Advisory Service (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of transborder flights.

**GPS** - Global Positioning System

GS - Ground Stop. Flights that are destined to the affected airport are held at their departure point for the duration of the Ground Stop. Ground Stops are implemented for a number of reasons. The most common:

- To control air traffic volume to airports when the projected traffic demand is expected to exceed the airport's acceptance rate for a short period of time.

- To temporarily stop traffic allowing for the implementation of a longer-term solution, such as a Ground Delay Program.

 The affected airport's acceptance rate has been reduced to zero

IFR - Instrument Flight Rules. A set of rules governing the conduct of flight under instrument meteorological conditions.

ILS - Instrument Landing System. A ground based precision instrument system that provides course and vertical guidance to landing aircraft.

**LAADR** - Low Altitude Airway Departure Route

**LAHSO** - Land and Hold Short Operation. Operations which include simultaneous takeoffs and landings and/or simultaneous landings when a landing aircraft is able and is instructed by the controller to hold-short of the intersecting runway/taxiway or designated hold-short point. Pilots are expected to promptly inform the controller if the hold short clearance cannot be accepted.

LO CIGs - Low Ceilings. Low Clouds.

**LOC** - Localizer. The component of an ILS that provides course guidance to the runway.

MINIT - Minutes in Trail. A specified interval between aircraft expressed in time.

**MIT** - Miles in Trail. A specified interval between aircraft expressed in nautical miles.

**MULTI-TAXI** - Many aircraft trying to taxi at once, creating congestion.

N90 - New York TRACON.

NAS - National Airspace System. The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas.

NAVAID - Navigational Aid. Any visual or electronic device, airborne or on the surface, which provides point-to-point guidance information or position data to aircraft in flight.

NM - Nautical Mile. International unit equal to 6076.115 feet (1852 meters).

NOTAM - Notice to Airmen. A notice containing information concerning the condition, or change in any component in the National Airspace System, the timely knowledge of which is essential to personnel concerned with flight operations.

NRP - National Route Plan. The NRP is a set of rules and procedures which are designed to increase the flexibility of user flight planning within published guidelines.

OTS - Out of Service.

RLSD - Released.

RRTES - Reroutes.

RWY - Runway.

**RWY CONFIG** - Runway Configuration.

RY - Runway.

STPM - Special Traffic Management Program.
Reservation program implemented to regulate arrivals and/or departures at airports that are in areas hosting special events such as the Masters Golf Tournament and the Indianapolis 500.

SWAP - Severe Weather Avoidance Plan. An approved plan to minimize the effect of severe weather on traffic flows in impacted terminal and/or ARTCC areas. SWAP is normally implemented to provide the least disruption to the ATC System when flight through portions of airspace is difficult or impossible due to severe weather.

**TACAN** - Tactical Air Navigation Aid. An ultrahigh frequency electronic air navigation aid which provides suitably equipped aircraft a continuous indication of bearing and distance to the TACAN Station.

TFC - Traffic.

**TRACON** - Terminal Radar Control Facility. A terminal ATC facility that uses radar and nonradar capabilities to provide approach control services to aircraft arriving, departing, or transiting airspace controlled by the facility.

**TSD** - Traffic Situation Display. A tool used by Traffic Management Specialists to monitor the position of air traffic and to determine the traffic demand on airports and sectors.

TSTMS - Thunderstorms.

UTC - Coordinated Universal Time is the standard time common to every place in the world. Formerly and still widely called Greenwich Mean Time (GMT), UTC nominally reflects the mean solar time along the Earth's prime meridian.

VAPS - Visual Approaches. An approach conducted under Instrument Flight Rules that authorizes the pilot to proceed visually and clear of clouds to the airport. Usually used in conjunction with Visual Separation. When using Visual Separation, a pilot sees the other aircraft involved, and upon instructions from the controller, provides his own separation by maneuvering his aircraft as necessary to avoid it. Visual Separation requires less spacing between aircraft than radar separation allowing more aircraft to land in a given period.

VFR - Visual Flight Rules. Rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the U.S. to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VOR - Very High Frequency Omni Directional Range. A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in Azimuth, oriented from Magnetic North. Used as the basis for navigation in the National Airspace System. The VOR periodically identifies itself by Morse Code. Voice features may be used by ATC or FSS for transmitting instructions/information to pilots.

VORTAC - A navigation aid providing VOR Azimuth, TACAN Azimuth, and TACAN distance measuring equipment (DME) at one site.

VSBY - Visibility. The ability, as determined by atmospheric conditions and expressed in units of distance, to see and identify prominent unlighted objects by day, and prominent, lighted objects by night.

WND - Wind.

WX - Weather.

Z - Zulu Time. Another term used to designate Coordinated Universal Time (UTC), the mean solar time along the Earth's prime meridian.

# FAA Set to Modernize ATC Over the Oceans

This next story came from the FAA, via Kevin P. Inscoe. Thanks, Kevin!

In anticipation of awarding a contract,\*
The Federal Aviation Administration (FAA)
has selected Lockheed Martin Air Traffic
Management to proceed to contract negotia-



tions following an international competition to replace the Air Traffic Control Automation System at three Air Route Traffic Control Centers.

The Advanced Technologies and Oceanic Procedures (ATOP) contract calls for the replacement of oceanic systems at the Anchorage, New York, and Oakland Centers, which handle air traffic in international airspace over the Pacific and Atlantic Oceans.

The new oceanic system will collect, manage, and display oceanic air traffic data on the computer displays used by air traffic controllers. The new system will integrate capabilities, such as flight data processing, radar data processing, automatic dependent surveillance, controller-pilot data link and conflict probe. The new system is expected to result in efficiency improvements, fuel savings for the airlines and better on-time performance for air travelers. ATOP will allow more planes to fly preferred routes.

Oceanic air traffic control differs from domestic air traffic control largely because there is no radar tracking of aircraft and no direct radio communication. Oceanic air traffic controllers must rely on other sources of aircraft position information. This data includes voice position reports from pilots derived from on-board navigation systems that include the Global Positioning System and communications satellite information.

During a competitive 18-month process, a team of FAA experts from different disciplines conducted a thorough analysis of products available in the worldwide air traffic control marketplace.

The FAA concluded that Lockheed Martin offered the best value and acceptable development risk. Lockheed Marin's proposed system is based on the system currently used by New Zealand for oceanic air traffic control and the Department of Defense and FAA's Microprocessor Enroute Automated Radar Tacking system. The Lockheed Martin proposed system would be modified to handle the busier and more complex U.S. airspace.

\* By the time you read this column, the contract may already have been awarded; however, this writer has not seen any evidence thereof to date.

# Houston Radio HF Services

Houston Radio is a fee-for-services Long Distance Operational Control (LDOC) station. Although they are privately owned and operated, they do use ARINC equipment and fall under their guidelines. Long-time subscribers may remember *Plane Talk*'s trip to Houston Radio back in 1988, with Gene Osburn, the Radio Services Supervisor, as our guide. These are the services offered by Houston Radio:

Message Forwarding: Air/ground message delivery is achieved through one of the three major vendors: ARINC, SITA, or AFTN. Fax, telephone, or other electronic options, such as email are also available for point-to-point message delivery.

**SELCAL:** SELCAL watch/hailing is available on all frequencies 24 hours a day. Flight crews are encouraged to maintain SELCAL watch once initial contact has been established. This will expedite the delivery of message traffic, such as redispatch clearances, weather updates, or other ground/air operational traffic.

Phone Patch: This service offers direct phone line connection over any of Universal's six radio circuits. No landline charges are assessed for connections within the continental United States.

**Flight Following**: Flight crews may continuously update company operations on the status of each flight via HF radio.

**Weather Updates**: Worldwide obs (observations) and TAFs available.

ADCUS: Flights entering the United States from international points are encouraged to make direct contact with Houston HF Radio as soon as possible once airborne. ETAs may then be forwarded to all appropriate government agencies. This is especially applicable for departures south of the 25-degree north latitude.

3013 — Night/close range

6637 — Night/day hours

10075 — Night/day hours

13330 — Day/night hours

17940 - Day hours only

21964 — Day hours only

That's it for this month. See you in October with more aero news, views, and frequencies. Until then, 73 and out.

### Table 1: Air Route Traffic Control Centers (ARTCC)

Center Radar Approach Control (CERAP) 7AB Albuquerque ZLA Los Angeles Salt Lake City ZAN Anchorage ZLC Chicago ZMA Miami ZBW Boston ZME Memphis 7DC Washington ZMP Minneapolis ZDV Denver 7NY New York 7FW Dallas-Ft Worth Oakland 70Δ 7HU Houston 70B Cleveland ZHN Honolulu (CERAP) ZSE Seattle ZID Indianapolis San Juan (CERAP) ZSU ZJX Jacksonville ZTL Atlanta ZKC Kansas City ZUA Agana (CERAP)

# **Regional Roundup**

ost DXers know about the "Clear" channels, AM frequencies occupied by powerful 50,000 watt stations, some of which cover half the continent at night. Back in May, I wrote about the "Graveyard" channels – six AM frequencies considered the most challenging on the dial because of large numbers of non-directional stations. There's a third category of frequencies, not quite as challenging as the "graveyard" channels, but more difficult than the clears.

"A regional channel is one on which several stations may operate with powers not in excess of 5 kilowatts. The primary service area of a station operating on any such channel may be limited to a given field intensity contour as a result of interference."

That's how the regulations for regional channels read. Today, the stations using these channels are known as Class B stations. The power

limit has since been increased to 50 kilowatts, though relatively few stations have been able to implement powers greater than 5kW. Most of these regional-channel stations either use very low powers at night, or use highly-directional antennas

The regional channels are spread across the dial. 550-630. 790, 910-930, 950-980, 1150, 1590, and 1600 are regionals; as are all the frequencies between 1250 and 1480 except those assigned as local channels. (Again, see the May American Bandscan for a list.) Stations using these frequencies also vary wildly in power and coverage. Some regional-channel stations near the bottom of the dial have coverage areas that blow away many 50 kW clearchannel operations.

What you'll hear on these channels depends very much on what part of the country you're in. In crowded areas like the Northeast and South, the regional channels may sound much like the "graveyards." In the Great Plains you may hear regional stations from hundreds of miles away. Even in crowded areas, certain channels will have interesting DX.

From here in the South, some of the best regional channels to try include 610 (WDAF, Kansas City); 620 (WTMJ, Milwaukee); 910 (WSUI, Iowa City); 960 (CFAC, Calgary); and 1420. (WVJS, Owensboro) During the daytime, WILL-580 Urbana, Illinois, is one of the most distant stations heard here.

When I lived in Wisconsin, two of my best catches were regional-channel stations: WIP-610 Philadelphia, and KGHL-790 Billings, Montana. Indeed, reports from other DXers suggest KGHL may be your best bet for logging Montana in the

# DX & crime fighting

Chip Kelley in central Texas operates a website (http://www.100000watts.com) with radio and TV listings for much of North America. Chip's site is intended for use by DXers looking for help in identifying their catches. He never

imagined someone would use it to try to solve a crime!

You may remember a series of kidnappings of children in communities along Interstate 10 this spring. All victims were eventually released; it came out that one of them told police she was held at a cabin where only three TV stations could be received. (KBEJ-2, KPXL-26, and KRRT-35) A San Antonio resident remembered the coverage maps on Chip's website. He found the area covered by these three stations, then eliminated areas also covered by San Antonio's other eight stations, and came up with an area near Kerrville as the likely location of the kidnapper's hideout.

The information was provided to police, who promptly ignored it. They concentrated their search in areas east of San Antonio, more than 40 miles from the site suggested by the maps. A few days later, police stopped some-

one on an unrelated tip. A frightened kidnapping victim promptly fled her captor, and the kidnapper committed suicide. And it happened... near Kerrville.

# Welcome to www.10000watts.com, the US radio & TV directory. Thanks to visitors like you, this is the most accurate place for FM and TV information in the US. If you have any radio or TV news or updates, please $\underline{\text{e-mail}}$ them in.

Top 40 KRBV 100.3 "Hot 100" Dallas/Fort Worth relaunches as dance top 40 "Wild 100"  $\,$ Rhythmic oldies WZJM 92.3 "92.3 the Beat" flips to modern rock "Xtreme Radio 92.3"

Classic rock WHBZ 99.7 Charleston SC flips to smooth jazz WJZX

WWW.100000WATTS.COM

Standards WBNL-FM 107.1 Evansville flips to classic hits WYXY "Y107"

Classic rock KULH 105.9 Wheeling MO flips to contemporary Christian

New WGRX 104.5 Fredericksburg VA signs on the air (country "Thunder 104.5")

New KBIL 104.5 New Orleans signs on the air

Spanish top 40 KQQQ-FM 92.1/KQQT 106.3 "La Nueva" Austin shifts to Tejano "Tejano 92.1 & 106.3"

News/talk WBDQ 94.1 Cross Hill SC flips to country WCRS-FM; the former WCRS-FM, WPBK 96.7 Greenwood, changes to a temporary simulcast pending its relocation into the Greenville/Spartanburg market

If the police only knew how sharp our visitors are...see how the coverage maps

pinpointed the I-10 serial kidnapper: 5/10 San Antonio Express-News article and coverage pic (or just text)
Rock WXRC 95.7 "95-7XRC" Charlotte shifts to classic rock "95.7, the Best Rock Ever

Oldies WACL 98.5 "Cool 98.5" Harrisonburg VA flips to classic rock "98 Rock"

Sports and talk **WSMB** 1350 "the Game" New Orleans flips to talk "Talk Radio 1550"; adult standards **WBYU** 1450 "Bayou 1450" flips to health talk/motivational/infomercials "Health Talk Radio" Standards **WLAM-AM/FM** 870/106.7 Portland ME flip to news/talk **WMTW-AM/FM** "NewsTalk WMTW" More info >> 5/3 Portland Press Herald article

### MORE...

# ¥ tv

- WEYB-LP 56 Florence SC flips calls to WPDF-LP
- New WRBW-DT 41 Orlando signs on the air (UPN)
- New KTMW 20 Salt Lake City signs on the air (religious)
- New WPBT-DT 18 Miami signs on the air (FPBS)

  More info >> 5/16 Sun Sentinel article

  New KWTX-DT57 Waco/Temple/Killeen signs on the air (CBS)

  Note >> KUHT-DT and KWTX-DT bring the number of digital TV stations to 200

  New KUHT-DT 9 Houston signs on the air (FBS)
- New WPXW-DT 43 Washington signs on the air (Pax)
- New KBGF 3 Douglas AZ signs on the air (Daystar)
- New WFOR-DT 22 Miami signs on the air (CBS)

## MORE...

http://100000watts.com is an excellent resource for identifying your FM/ TV DX catches. In one case, it also served as a crime-fighting tool!

# Mailbag

Matt Cenatiempo of KMIC-1590 Houston wrote to thank me for the item about KAVT-1680 in the April column. His general manager at fellow Radio Disney station KMIC got a kick out of it. Matt says there are currently 49 Radio Disney stations and counting. (After his letter, they added #50: WICE-550 Pawtucket, Rhode Island.) We should expect KAVT to follow the other Disney affiliates in adopting a callsign reminiscent of one of the Disney characters or Disney itself.

NRC AM Radio Log Editor Wayne Heinen has put pictures of his AM verification letters and QSLs from Colorado stations up on the web. Check out http:// hometown.aol.com/nrclog/ index.html.

KGHL-790 Montana is my best regional channel logging. What's yours? Write me at Box 98, Brasstown NC 28902-0098, or by email to w9wi@w9wi.com. Good DX!

» Lietinge

» Dedates

» SEARCHES

» FAQ

# UTER LIMITS

# **Pirate Radio Thriving**

either summer static, longer daylight hours, nor the slump in international broadcasting has impacted the volume of pirate radio activity. A bumper crop of stations news fills our page this month.

# What We Are Hearing

We have another solid list of more than two dozen stations logged by MT readers. Most were on or near 6955 kHz, but many stations scoot down to near 6950 kHz as darkness approaches to avoid interference from Peruvian broadcasters.

- Blind Faith Radio- Dr. Napalm, in a press release to MT, says that his classic rock pirate is once again active after a brief higtus. He advises that we should also look for a sister KMART Radio. station (Uses blindfaithradio@vahoo.com e-mail)
- **Buckwheat Radio-** Rock music is their normal fare, but sometimes they make things interesting with a low power test. (Uses buckwheatradio@hotmail.com e-mail, but also asks for reports to the Free Radio Network web site)
- Ground Zero Radio- Recent shows with host Dave Gunn parodied United Patriot Radio. Most broadcasts are full of satire, comedy, and drama features. (Blue Ridge Summit)
- KBLK- Rap music dominates their shows.
- KRMI- One summer show from Radio Michigan International was a nostalgic radio replica of World War II pop music. Obviously this pirate can be eclectic. (Uses krmi6955@hotmail.com e-mail)
- Radio Bingo- The radio bingo game, of somewhat questionable propriety since John Arthur always wins, has joined the ranks of pirates with a RealAudio feed. Try http:// members.nbci.com/piratestuff/ radiobingo\_06-06-01.ram on your internet dial. (Uses radiobingo@chek.com e-mail)
- Radio Cochiguaz South America's most active pirate mixes their own shows with relays of other pirates. They are active once or twice a month on weekends, normally using variable 11425 kHz. (Santiago)
- Radio FCC- This new one came on this summer with rock music. Most people don't believe that they really are a voice of the Federal Communications Commission. (None)
- Radio Free Speech- Bill O. Rights is active again, sometimes with his classic comedies about freedom, but other times with relays of other pirates. Look for him in AM mode. (Belfast)

- Radio Piraña Internacional- This South American pirate has resurfaced, with irregular weekend shows on 11417 kHz. (Merlin, plus now uses rpi@writeme.com
- Radio Three- As we see here this month, Sal Amoniac's pop rock station sometimes uses an ID of 3-Rock. (None, only verifies logs in The ACE)

# Radio 3 -\*- 3 Rock

Sales address:

PO Box 3333 Ft Lauderdale, FL 33333-3333

phone: 1 333 333-3333

- **RBCN-** Radio Bob is now a longtime veteran pirate. His original programming, normally with a southern humor slant, remains a favorite on the unlicensed bands. (Lula)
- Shadow Radio- The format here has settled on a combination of modern rock music and radio dramas from over 60 years ago. (None)
- Sycko Radio- Rock by people like Eminem is their staple, but they recently solicited Screwdriver Man to fix their transmitter. (None)
- Take It Easy Radio- Their combination of thirty year old soft rock and pop with historical documentaries is a new feature this year. (Belfast)
- United Patriot Radio- The only domestic USA clandestine in history continued its amazing run through June 15th, making it the longest-running domestic United States shortwave clandestine. However, Steve Anderson made a public statement that June 15th was its last day. He blamed lack of financial and moral support, not threatened government enforcement actions, on the closure.
- Voice of Bizarro World- Xhem's classic backwards station still begins shows with a sign off, with a sign-on at the end. (None cur-
- Voice of Captain Ron Shortwave- Captain Ron's rock is now supplemented by a quesand answer feature. (captainron6955@hotmail.com e-mail)
- Voice of the Angry Bastard- The station name sounds threatening, but recent shows have been primarily a mix of rock and country music. (Belfast)

- WHYP- James Brownyard recently hosted a station croquet tournament between the rock tunes. Sometimes other pirates such as Captain Ganja join in the fun. (Providence; also uses whyp1530@yahoo.com e-mail)
- WKUE- This month's mystery was a return of these classic call letters to the pirate bands. Nobody seems to know if it was a reactivation, a relay, or whatever. (None)
- WMFQ- The rock music tunes on this one are not out of the ordinary. But, since all IDs are given by a chanting male chorus with an obscene slogan guaranteeing QSLs, you will certainly recognize them if you hear them. (Providence)
- WMOE- The Three Stooges provide the audio between the rock tunes. Soitenly! (None)
- WVDA- Ham radio will never be the same. The first broadcast of this new pirate with host Willy Wang was announced as a transmission from the Dayton Hamvention. But, the flea market must have been sparse this year, since they had technical difficulties. (Uses wvdapirate@yahoo.com e-mail)

### Reports and OSLs

Reception reports to pirate stations require three first class stamps for USA maildrops or \$2 US to foreign locations. This finances postage for a souvenir QSL to your mailbox. Send your letters to these addresses: PO Box 1, Belfast, NY 14711; PO Box 28413, Providence, RI 02908; PO Box 109. Blue Ridge Summit, PA 17214: PO Box 24. Lula, GA 30554; PO Box 293, Merlin, Ontario NOP 1W0, Canada; and Casilla 159, Santiago 14, Chile. A few pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. Reports to the Free Radio Network (FRN) go to http://www.frn.net/ on the web. Free Radio Weekly loggings go via niel@ican.net email. Sample copies of *The ACE* are \$2 via the Belfast maildrop.

# Thanks

Your input is always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address atop the column. We thank every one of our contributors: John T. Arthur, Belfast, NY; Artie Bigley, Columbus, OH; Cachito, Santiago, Chile; Ross Comeau, Andover, MA; Captain Disturbio, Dayton, OH; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; Vince Havrilko, Beale AFB, CA; Harry Helms, Ridgecrest, CA; Jim Keeling, Lenexa, KS; Greg Majewski, Oakdale, CT; Bill McClintock, Minneapolis, MN; Dr. Napalm, Belfast, NY; Lee Reynolds, Lempster, NH; Martin Schoech, Merseburg, Germany; Bud Stacey, Setsuma, AL; and Niel Wolfish, Toronto, Ontario.



# **LF Receiving Antennas, Part III**

y first "real job" after college was at Scientific Radio Systems (SRS) in Rochester, NY. I was excited to start my new position as a Technical Writer Trainee, in large part because SRS had just landed a contract with the FAA to build 160 longwave beacons, and a number of monitor receivers — complete with active antennas. I'd be writing about something I enjoyed as a hobby...What more could I ask for?

A few days into the job, I was introduced to the engineer in charge of the active antenna for the FAA system. He showed me a prototype design consisting of an aluminum rod about 1 meter long, attached to a small box housing the antenna's amplifying circuit. I was amazed at the short length of the antenna because I assumed antennas had to be huge to work on LF. How could such a tiny thing work on a band where wavelengths approach a mile?

I soon discovered that these antennas could work very well on longwave. In fact, when properly installed, I saw that they could rival (or beat) wire antennas hundreds of feet long. This month, we'll discuss the characteristics of active antennas for LF reception. In case you're just joining us, this is the third and final part of a series on receiving antennas. The two previous columns discussed the merits of random wire antennas and loop antennas, respectively.

#### What's in a name?

Active antennas get their name from the fact that they contain active (powered) circuitry for boosting the very weak signals picked up by the antenna rod itself. In a nutshell, what the antenna lacks in length, it tries to make up for in amplification. A good design will also contain low-pass filtering to attenuate signals above 500 kHz. This minimizes the chance of AM broadcast interference.

Active antennas have several advantages for today's listener. First, their small size makes them easy to mount on a vent tube, gutter, or small mast. Also, because they are small, they tend to be less of a "noise collector" as compared with a random wire antenna – a clear advantage for urban dwellers. Finally, active antennas have an omni-directional response. While this might be a disadvantage to some, an omni antenna gives you the "big picture" while tuning across the band. You can always switch to a directional "loop" antenna when you find a signal of interest. With a loop alone, you're apt to miss many signals that are not in the favored plane of the antenna. If I could only have one antenna for beacon chasing, I'd want it to be omni-directional.

Active antennas require DC power to operate. Usually, the power supply is located inside the shack, and might be as simple as a 9-volt battery, depending on the power requirements of the antenna's amplifier. Nearly all designs use the coax feedline to deliver DC power to the antenna, so there's no need to run separate wiring.

#### Build or buy?

It is not difficult to build your own active antenna. Articles for doing this have appeared in the *Lowdown* from time to time, and if you have the means to go way back, you'll find a legendary series by experimenter Ralph Burhans in the March, April, May and June 1983 editions of *Radio-Electronics* Magazine. (You can find these issues on microfilm or microfiche at many large libraries.)

A homebrew design by Andre' Kesteloot, N4ICK, can also be seen on AMRAD's web site at http://www.amrad.org/projects/lf/lfpreamp.html. It is a remotely-tuned design using a varicap diode whose capacitance is adjusted by a control in the shack. Because it has sharp tuning, this antenna may be well suited for those troubled by AM broadcast, or other strong signal interference.

At present, there are few commercially made active antennas specifically designed for LF. One exception is the L400B by LF Engineering Co. (17 Jeffry Rd., East Haven, CT 06513). This antenna is a sealed, 26-inch "E-field probe" that cov-



Figure 1. The L400B active antenna is a commercial design made by LF Engineering Co., East Haven, CT.

ers the spectrum from 3 kHz to 530 kHz, and includes a sharp roll-off filter to limit signals above this band. I use an L400B at my station, and have found that it compares favorably with a 250-foot wire antenna. In certain parts of the band, the L400B gives considerably stronger signals than the wire antenna. Approximate cost: \$130.00. You can visit the LFE web site at http://www.lfengineering.com/.

Another, but more pricey solution, is the RF Systems LFA 520 active antenna (approx. \$280.00). It was originally designed to fill a professional application, and offers coverage from 9 to 520 kHz. Like the LF Engineering model, the antenna contains filtering for strong out-of-band signals to overcome the problem of overloading. At a height of 6.9 feet (2.1m) the antenna is longer than most active antennas, and it includes a topload section consisting of a 3/4 sphere with a diameter of 32 inches (0.8m), made of four radials. Like the other products I've seen from RF Systems, the construction of this antenna appears to be well above average. You can read more about it on the web at www.universal-radio.com/catalog/lwant/ 3060.html

#### Antenna Conclusion

I hope this series has helped you understand more about the antennas that are typically used on the frequencies below 500 kHz. As with many things in radio, there is no single antenna that will be right for every circumstance. Much depends on your listening interests, your location, and of course, your budget. Although the radio hobby has gotten complex in recent years, antennas are one area where the homebrew builder can still construct an effective design without knowing a lot of theory or needing to buy expensive parts. So, whether you build or buy, enjoy experimenting with antennas!

#### Canadian Calls

Jacques d'Avignon (ON) provides the following call signs for Canadian NDBs. No locations or frequencies are given, as these are assigned to the Department of Defense, and are mobile. They may show up anywhere in the country and on any "normal" beacon frequency. Should you hear one of these callsigns, it could be a special military exercise and would be considered a rare catch.

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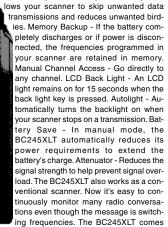
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# Dog Days in the Great Outdoors

his is August and I am in the mood to relax, kick back and think loose notions about topics ham radio related. Yes, I fully intend to ramble and become somewhat tangential in my thinking here. Chalk it up to the Dog Days of Summer. I'd rather be out under a tree somewhere operating than sitting at a word processor cranking out words. Yes, friends, it is the time of year when I choose to spend any number of days playing radio in the outdoor

Putting up antennas is always a bit of an adventure. Especially wire antennas. Getting the wire (or wires) as high as possible and as far away from things that will interfere both in terms of signal and for safety reasons can try a ham's patience. Now, if you're like Old Uncle Skip, and you occasionally like to take your amateur radio activities out into the outback, you have the added necessity of making your set-up work in an alien environment. This could be for Field Day, a camping trip or vacation. Further, you want to be able to take things down quickly and with no disturbance to the local flora and fauna.

This, as with most good things in amateur radio, involves both planning and technique to get the job done right. While the ideas I share here in this month's column are designed to help out the field venturing ham, I think you will find that much of what I say can be applied to the hanging of any wire antenna.

#### Anticipate problems: bring a tuner

In the initial planning stages, you should, as the Cheshire Cat said, "Begin at the beginning." This would be with your transmitter. Modern solid state transmitting gear often have circuits designed to protect the final transistors from overly mismatched antenna/feed line combinations. Usually, if the SWR rises above around a 1:3 ratio the rig will either reduce power significantly or shut down altogether. This is a very good thing for obvious reasons.

However, field antenna set-ups are subject to all kinds of forces that cannot be simply calculated for when constructing the antenna at home, so it is good to know a radio's "wiggle factor." I am sure, if you've read my old columns you know my feelings on the illusory nature of the 1:1 match and that I'm usually happy as a clam if I can bring things down to 1:2 or thereabouts. There are two ways to skin this particular (with apologies to Mr. Cheshire) cat.

Use an antenna and feed line combination that is going to give a reasonable impedance

(nominal 50 ohm) that will keep things within the limits of the rig's tolerance.

Use a tuner designed to bring the antenna and feed line combination into the transmitter's operational impedance window.

My general practice has been to combine the best of the above worlds. I'll cut my wires to formula, but put a tuner in line as well because it has been my experience that it is a rare case when you can get any field op antenna up in what passes for ideal conditions – the requisite quarter wave in the air and in the clear of interfering objects. In a "make do" world an antenna tuner can cover a multitude of SWR sins.

If you want to travel first class, look to any of the current transceivers that have a built in Automatic Antenna Tuner (ATU). There are also outboard ATUs available. One prominent name in the field is LDG Electronics Inc. (http:// www.ldgelectronics.com/). I don't know if I've become lazy in my old age but I can't imagine playing radio without this feature. I've fought my share of RF battles and have a box full of fried finals to prove it! I am hopelessly hooked on

#### The right antenna for the band

Another thing to consider is your operating band plan. Okay, your rig might have five or more bands available. It is unlikely that the Propagation Gods are going to smile on all bands for the duration of your trip. Maybe you plan on working 20 meters in the afternoon and switch to 40 meters later at night. It's a lot easier to cut wires for two bands than it is for five or more.

I've recently built an Elecraft K1(http:// www.elecraft.com) for use on vacation and on road trips. I built it for 40 and 20 meters and (of course) I added the optional ATU unit. I simply carry 1/4 wave wires for each band. When I am



The LDG RT-11 Autotuner is a remote mounted ATU that can be used with most transceivers from 5 to 150 watts. (http:// www.ldgelectronics.com)

using the 40 meter wire I use the 20 meter wire as its counterpoise. When I use the 20 meter band I use another piece of wire cut to 1/8 wave on 20 as the counterpoise. Three simple pieces of wire that can be thrown into trees, hung over a balcony or run along a room's baseboard get on the air and making contacts in short order wherever I travel. Since I am operating using "random length" wires, I don't even have any feed line considerations. (I do have to watch out for stray RF, but that is part of the adventure).

#### Going mobile with a dipole

Okay, let's say random wires aren't your cup of tea. Dipoles are very effective if you can get the space to make use of them. Using the above band-limiting practice I would probably opt for a 40 meter dipole. Why, you may ask? Because an old Novice trick is to load your 40 meter dipole on 15 meters. Do the math; it works out just fine. Two bands, one antenna: Not a bad set-up. I seriously considered building up my K1 as a 15/40 radio for just this reason. I have talked to a number of hams who did this and they are very happy with the result.

Talk of dipoles moves us into a discussion of wire sizes. This is because dipoles mean transmission lines. Feed lines have a certain amount of weight and heft to them. You need to choose a wire gauge for your antenna design that is potentially capable of holding up the feed line at the center. The solution for most folks is #12 or #14 gauge wire, preferably "copper-weld." This applies absolutely when dealing with permanent sky wires. However, for temporary field use, you can go lighter by far. I commonly use #20 gauge wire, making sure my center insulator is strong enough to relieve the strain on the dipole wires. This problem is all but eliminated if you hang the dipole in an inverted "V" arrangement.

Now to the transmission line itself. You have two options that essentially depend on the nature of your antenna tuner. RG-8X coax has very good characteristics and is reasonably light. Many backpackers who are shedding ounces make use of the much thinner RG-174 coax. You need to keep the feed line relatively short as the losses per length are much higher than with RG-8X. Chances are your portable set-up will be low power or even QRP, and you don't want to sacrifice too many decibels. Personally I've never been convinced that the weight advantage of RG-174 overcomes any signal loss from its use. But on the other side of the matter, I've talked with many hams who use it under real world conditions with good results so, as they say, your

mileage may vary.

#### **Multi-band solutions**

Now let's make things really interesting. Let's say you don't want to limit yourself to one or two bands. You're an "all bands all the time" type of amateur. Is it possible to have your cake and eat it too without carrying many great spools of wire? Well, it can be, especially if you make use of a tuner that can work with "balanced" feed lines. This is either common TV "twin lead" or the more radio specific "ladder line."

Now you're in a position to play with some neat field op multi-band antenna ideas. One classic antenna that can work well in the field or even at a home station is a dipole cut for the longest frequency of intended operation. Feed this puppy with a balanced feed line (I usually use TV twin lead for anything under 100 watts) and connect it to your radio through a balanced wire tuner and you will find you should be able to bring things into the manageable SWR range for just about any higher frequency of operation you desire. I used just such an antenna set-up at my home station for years and earned my WAS (Worked All States) and DXCC (DX 100 Countries) with it. I've also made use of this design in the field with great results.

Off center fed wires can also be pressed into service as multi-band antennas. There are several designs and formulae for determining the best location for the feed point. I usually refer people to L.B. Cebik's website treatise on the subject for

details. (http://www.cebik.com/gup9.html) Commercial versions of this design are available from a number of resources, most notably RadioWorks' well known "Carolina Windom" design. (http:// www.radioworks.com/) This antenna is a great idea for field operations.

Last but not least, another popular field antenna that is underrated but well worth considering is the full wave loop. Again, cut for your highest frequency of operation and feed with balanced wire and tuner and you're off to the races. It can be hung as a square (or as close to a square as the trees will allow). I prefer a delta loop configuration. This requires only two trees and the feed can be at the bottom (yeah, I know it's the opposite of what the books all say) closer to your station. Whenever my QRP club gets together to play radio outdoors, a loop or two will be up in the air.

The loop is still a neat idea if you're not planning multi-band operations. Cut it to frequency and use a 4:1 balun at the feed point. Then you can run coax back to the rig. Cut right, an ATU will be very happy with such a design. I have observed that, once folks get over the initial questions about loops, they become very popular antennas.

#### Safety in the Field

Allow me to expound briefly on matters of field safety. Don't string your wires anywhere that people or even larger animals are likely to get entangled. I often get out to my field set up by way of a mountain bike and the last thing I want to experience is being "clotheslined" by another ham's antenna. Respect everything that is around you because you are only a visitor. Take nothing but pictures, make nothing but contacts, leave nothing but footprints.

If you want to learn more about playing ham away from home a great website is that of The Adventure Radio Society (http:/ /www.natworld.com/ars/). Nice folks who really know how to have fun.

#### Kiwa Pocket Loop

The Kiwa Pocket Loop is a 12.5 inch diameter Air Core Loop Antenna that collapses to fit in your pocket! This antenna is designed for portable receivers to enhance MW and SW reception. Tuning is from 530 kHz to 23 MHz using a battery powered low noise amplifier. No direct connection to the receiver is required. The special coupler is simply slipped over the whip antenna for improved reception.

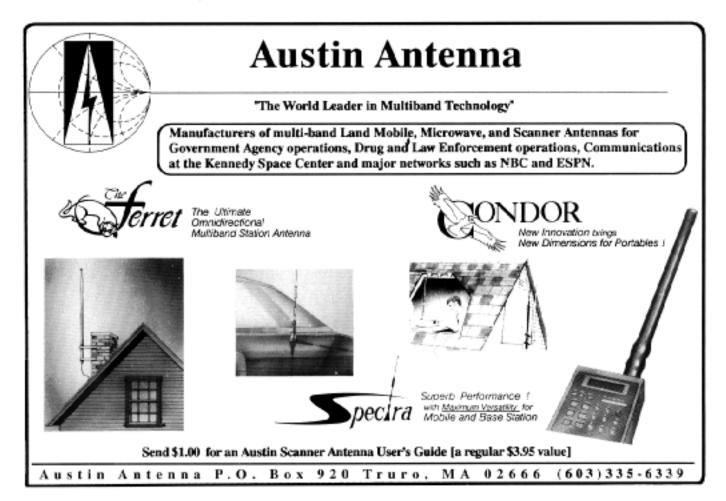
The Kiwa Pocket Loop is the ideal travel companion for those who require a loop antenna for on the go

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# The SW-54 Plays Again!

ast month's work session on this 1950era shortwave set from The National Company was devoted mostly to housekeeping issues. We polished the metal cabinet with auto rubbing compound, followed up with a coat of hard wax, and attempted to rejuvenate the copper finish on the radio's chassis. When the latter proved to be impractical, the chassis was carefully cleaned and brush-painted with a good-quality copper paint that closely matched the original color.

To facilitate the cleaning and painting, the output transformer was dismounted (but not disconnected), and the tuning dial scale and all tubes were removed. Finally, the volume control, bandswitch, and slide switches were treated with aerosol contact cleaner spray.

#### ♦ Is it Right to Recap?

In preparation for this month's work session, I had ordered a complete set of replacement paper and electrolytic capacitors for the SW-54. I'm sure that I've mentioned, when discussing past restorations, that the old-style wax-coated paper caps and electrolytics found in vintage radios are not to be trusted. However, the plastic-cased mica caps — which are used mostly in the radio's frequency-determining circuits — do remain stable over time and generally don't require changing. That's fortunate because those tend to be very difficult to remove without dis-

turbing critical r.f. wiring and also must be replaced with exact equivalent values.

I never plug in a set to be restored until I've changed out all of the paper and electrolytic caps. Have I given you this sermon before? A leaky or shorted capacitor can quickly cause the destruction of other parts that would be very difficult or expensive to obtain – such as i.f. and power transformers. Purists may object to the change in looks caused by the removal of the vintage caps with their distinctive markings and appearance. Some go so far as to melt the wax on the old units, remove the guts, insert modern caps inside the paper cylinders, and refill with melted wax.

I have no quarrel with that philosophy, but frankly I'd rather not use my time on that kind of restoration. If you agree with me, but still feel guilty about "desecrating" the set, you might consider putting the old set of caps in a plastic bag with an appropriate note for future owners. If you store it inside the set, however, keep the bag away from tubes or other components that heat up!

I will confess to one regret about wholesale recapping of a radio. It takes away much of the fun of troubleshooting – which usually boils down to logical tracing of inappropriate resistance or voltage measurements to a capacitor that failed. In other words, it can make a restoration project just a little too easy! When I first began restoring radios, I spot-replaced only the

capacitors that required it. But, I soon came to realize that if a radio was worth restoring, its long-term survival was worth ensuring with a new set of capacitors.

#### Ordering Capacitors

New caps, which will be much smaller and far more reliable than the originals, are inexpensive and easy to get. You can't buy them, with the working voltages required, at your corner Radio Shack, however. As you might expect, the caps generally available there are low-voltage types for semiconductor circuitry.

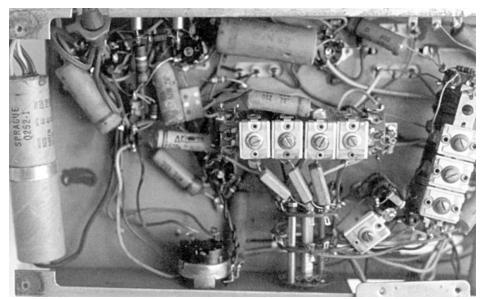
I purchased a complete set of 15 capacitors from Frontier Capacitor [403 S. McIntosh St., PO Box 218, Lehr ND 58460; phone toll free (877) 372-2341; fax (701) 378-2341; e-mail frntcap@bektel.com]. The cost was \$10.30, \$4.50 of which was for Priority Mail shipping. Service was prompt and courteous.

Looking over the flyer Frontier shipped with the order, I saw that their minimum order was actually twenty dollars, exclusive of the shipping cost. However, the gentleman who took my phone order never brought that up! Frontier will ship on an invoice once they have previous experience with you as a customer. This means you can phone, fax or e-mail your order and have it shipped immediately, even if you are paying later by check.

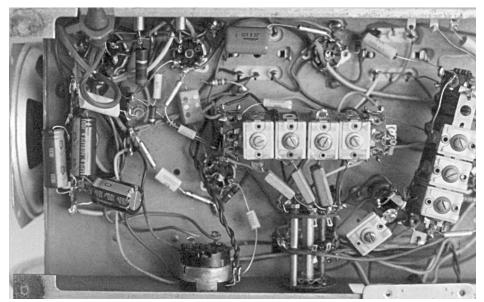
I should mention that Antique Electronic Supply [6221 S. Maple Ave., Tempe, AZ 85283; phone (480) 820-5411; fax (800) 706-6789] is also a good source of replacement caps. In addition, the company also stocks a great assortment of parts, supplies, and books for the antique radio restorer. Write or call for a free catalogue and/or check their web site at http:www.tubesandmore.com.

When ordering, don't get hung up on obtaining units with *exactly* the same voltage or capacitance ratings as your originals. Even though the capacitance of the proposed modern replacement may be expressed to four decimal places, you needn't be concerned. Most applications for paper or electrolytic capacitors in radio receivers are non-critical as to value. In this recapping job, I replaced .005 mfd paper units with .0047s; .02s with .022s; and a .25 with a .22. I could have deviated much farther than that and gotten away with it.

All of these replacement caps were rated at 630 volts, even though no voltage higher than 150 is encountered anywhere in the set. Just make sure the rated voltage of the replacement is at least as high as that of the original.



Underchassis view prior to recapping. All original wax/paper units still in place. Note large cylindrical multiple electrolytic at left.



Underchassis view after recapping. Three of the four electrolytics replacing the original multiple unit can be seen at left.

The capacitance specs of my replacement power supply electrolytics differed even more greatly than those of the paper caps. Electrolytic units are used to obtain much higher capacitances at reasonable case sizes than possible with paper units – usually for the purpose of filtering hum in power supply circuits. But, electrolytic cap technology has improved so much, that we can now obtain very large values in amazingly small packages. Units with the smaller capacitances are now hard to find. And, within limits, the higher the capacitance the better the results in power supply filtering circuits.

As was common in sets of this vintage, all electrolytics used in the SW-54 were combined in a single large cylindrical case. Connections were made via color-coded leads emerging from the body of the cylinder. These multiple-unit electrolytics are now all but unobtainable, but can easily be replaced by a group of individual units taking up much less space.

As to capacitance, I just used the closest sizes I could get. I used a 100-mfd unit instead of the original 60; 47s in place of the 40s. When it comes to the working voltage of an electrolytic, however, it's important to get close. Electrolytics don't develop full capacity except when used near their rated voltage. I used 160-volt units to replace the original 150s – close enough.



Though still without its cabinet, the little SW-54 has been reassembled for initial testing.

Also in the original multiple unit was a 5-mfd, 15-volt cap used as the cathode bypass in the audio output stage. In this application, it's important to stick reasonably close to specs, and I was able to locate a 4.7-mfd, 25-volt that did the job.

#### The Replacement Process

Obviously, when recapping a set, it's best to change one unit at a time. Make sure you will remember exactly what terminals or solder lugs the old capacitor was connected to before you remove it. If the wiring is crowded or confusing in the area where you are working, you might like to make a little sketch so there will be no doubt about where the replacement is to be connected

As mentioned during the Philco "Transitone" restoration (January 2001 issue), I generally prefer not to take apart an old connection, particularly if it has multiple leads, in order to remove and replace a capacitor. Instead, I leave a stub of the old lead and use a "butt connector" (Radio Shack Cat. No. 64-3036A) to solder-splice the lead of the new component to the stub. It's neater, and less destructive to the radio.

However, in this case, because of the soldering style used in the original manufacture of the set, it proved to be fairly easy to take many of the old joints apart nondestructively. I resorted to the butt-splicing technique in only a few instances. I took my time, and did my best to remove all of the clipped leads and stray solder drops as I went along in order to avoid short circuits.

Replacing the multiple-unit electrolytic required making special arrangements. I clipped all of the old leads as close to the body of the unit as possible, after making sure I understood the color coding system that was used. Then I removed the old electrolytic by breaking off its mounting strap close to the spot where it was riveted to the chassis. One of the speaker mounting screws looked like it would serve as a conve-

nient fastener for a terminal strip I needed to connect the four new individual electrolytics. So I replaced the speaker at this time and installed the strip. Then I simply wired the new units onto the strip, using the original leads from the old multiple unit to connect them into the circuit.

#### The Moment of Truth

After reinstalling the output transformer, I cleaned off and reinstalled the dial scale – making sure I would not be removing any of the markings with the damp cloth I was using. I'd heard too many horror stories about stenciled dial markings being wiped right off along with the grime by over-zealous restorers! Luckily, this scale presented no such problem.

I didn't reinstall the SW-54 set in its cabinet at this time, in case further work needed to be done, though I temporarily installed the control knobs on their shafts. I also cannibalized the pilot light from my "parts set" to replace the one missing from the restored radio. Finally, I hooked up a temporary power cord (the old one still needs to be replaced) and turned the old girl on. After warmup, I was pleased to hear the reassuring sound of static coming from the speaker. With a short length of wire as an antenna, I was able to hear stations all over the broadcast band and receive at least one signal on each of the other three bands.

Next month, we'll realign the set and try it out on an outside antenna. See you then!



Antique Wireless Association, Inc. . Box E, Dept. 2



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# **An Antenna for VHF and Higher Frequencies**

ith this month's column we finish a six-month series discussing antennas as utilized across the RF spectrum. To complete the series we will discuss building an axial-mode, helical antenna (AMHA). This antenna was invented by John Kraus – a physicist well known for his contributions to both antenna engineering, and for his pioneering work in radio astronomy. Due to size considerations Kraus's helical antenna is most often utilized at UHF, and particularly at microwave frequencies. On the other hand, some very large versions of the AMHA have been designed for frequencies as low as the HF band.

To the old timers among us Kraus is probably best known as the inventor of a different antenna: the W8JK; named for Kraus's ham callsign. The W8JK is the beam which initiated the trend toward today's close-spaced, high-gain, HF beam antennas.

#### The AMHA:

The AMHA radiates and receives best off the end of its helix opposite to its reflector (fig. 1). It is a beam antenna of substantial gain; the gain varying primarily as the number of turns in its helix.

An important characteristic in the performance of the AMHA is its circular polarization (CP). Due to various factors the polarization of signals received continuously from a single source may vary significantly over time. If the polarization of a linearly-polarized antenna (such as a dipole or groundplane antenna) and the polarization of the signal which it is receiving approach a difference of 90, this can produce signal-strength loss as great as 30 or more dB (5 or more S-units).

On the other hand, the maximum signal loss due to polarity mismatch between a circularlypolarized antenna and any orientation of linearlypolarized signals is a mere 3 dB (half an S-unit). This aspect of CP makes the AMHA a good choice for applications where signal polarization is quite variable such as in communication between satellites and earth stations, and in moonhounce work

If the helix of an AMHA is wound in a clockwise manner, as viewed looking from its feed-point end, then the antenna is said to have a right-handed polarization sense. If wound counter-clockwise it has a left-handed sense. For AMHAs the sense of the received signal must be the same as that of the receiving antenna, or there is a loss of 30 dB or more in signal strength. Therefore it's important to know that if there is signal reflection along the propagation path, the signal's sense reverses for each reflection!

Pleasantly enough, modest errors in constructing the AMHA have relatively little effect on its performance. Another plus is the broadbanded nature of the antenna. Typically it will cover a band about half the size of its design center-frequency. Thus an AMHA designed for 400 MHz will cover a band about 200 MHz wide, or from 300 to 500 MHz. Such bandwidth makes this antenna useful for wide signals like television.

#### Let's Make One:

The antenna configuration, dimensions for a 435 MHz, 4-turn version, and equations to design for other frequencies are shown in fig. 1. See this week's interesting website below for even more design information.

The wire for the helix can be 1/4 inch tubing (pinch and solder the ends closed), heavy wire, or the outer conductor of coaxial-cable (solder the inner conductor to the outer at both ends, or remove it). Conductors of smaller diameters have been used with good results, but give less-broad

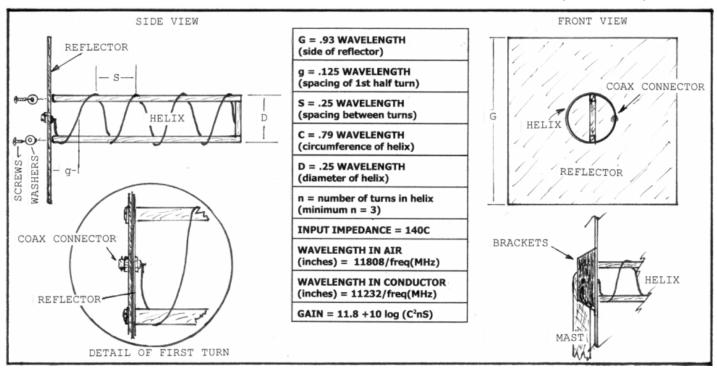


Fig. 1. An axial-mode, helical antenna with measurements for 435 MHz, and essential equations.

#### This Month's Interesting Antenna-Related Web site:

This site has info for designing your own AMHA, plus links to free computer programs which help you do it!

http://www.applet.cz/~ulcak/helical\_antenna.htm

bandwidths. I found that one of the cook pots in our kitchen made an excellent form to shape the circular windings of my helix. The more turns you use the greater the antenna's gain, and the more narrow its major lobe.

To match the antenna's input impedance to 50-ohm feedline the helix comes off the feedpoint connector very close (1/8 in.) to the reflector and slowly raises to 1 in. at 5 in. from the connector, then to 3-3/8 in. (this is measurement "g" in fig. 1) a half-turn out from the connector. The connection between helix and input connector must be good; soldering is preferred.

Conductors such as galvanized metal, aluminum or copper sheet metal, or galvanized hardware cloth can be used for the reflector. Metal brackets may be necessary to hold the reflector rigid. My hardware cloth (1/4 in. holes) reflector was reinforced with a masonite-board backing for strength.

The helix supports must be of non-conducting material such as dry wood (varnished for outside use), plastic or fiberglass. My helix supports were 3/4 x 3/4 in. wood held to the reflector using large sheet-metal screws with very-large washers. The windings may be kept in place on the supports using notches in the supports and glue with plastic string, or wood pegs and glue, etc. No conductive material used here, either. The construction you choose must fit your intended use of the antenna. Mine are used in temporary situations, and never left out in bad weather. You should use more durable construction if you plan to leave your AMHA permanently outside.

A mast of 3/4 in. wood is held to the back of the reflector bolted between two wood brackets. This is shown in side view in fig. 1.

As with any antenna, don't work on this one when it is transmitting, and stay out of the path of its beam when it is transmitting. If you mount it outdoors use some kind of lightning protection. The minimum is to never use it during weather likely to produce lightning, and disconnect and ground it when it is not in use.

#### An Interesting Bit:

The Radio Society of Great Britain's Radio Communication Handbook (4th edition), in discussing circular polarization and VHF-UHF antennas, suggests that slanting an antenna at 45 degrees from vertical gives a compromise between horizontal and vertical polarization. Using this technique average signal improvement of 6dB is claimed for reception of typical, mixed polarity signals.

#### **Antenna Contest:**

Entries are in for our Unusual Antenna

Contest. We'll be going over them, and the winner will be announced next month. Stay tuned!

#### **Correction:**

If you didn't catch the earlier correction notice be aware that there should be no connection from the +9 volts to the antenna element in the diagram for the active antenna in the June column.

# RADIO RIDDLES

#### **Last Month:**

I discussed mounting an antenna lower toward the ground to improve communication over hills, and then asked "how this could be true?" After all, wouldn't we be more likely to get signals over the hills if we raised the antenna? I also asked what NVIS is.

Well, NVIS is the acronym for "Near Vertical Incidence Skywave." Skywaves which leave an antenna site at higher (more nearly vertical) angles come back to earth closer to the antenna site than those which leave at low-vertical angles. To explain this, think of squirting a garden hose straight upwards (high-vertical angle). The water falls back all around you. Squirt the water away horizontally (low-vertical angle) and it comes to earth far from you.

Radio waves reflecting from the ionosphere act somewhat similarly as they return to earth, not due to gravity as the water does, but due to being refracted from the ionosphere (groundwaves excepted).

Say that you mount your HF dipole or other horizontally-oriented, linear antenna close (about 1/4 wavelength) to the earth. Then the reflections of your signals from the ground combine with signals leaving the antenna to favor upward (high vertical angle) radiation. These transmitted signals refract from the ionosphere, and return to earth all around the area from which they are launched. Thus they can enter nearby valleys which are blocked to low-angle vertical radiation by the hills surrounding them. We'll discuss NVIS more in the future.

#### This Month:

Is a single-turn, circular-loop antenna circularly polarized? Must an antenna be circular to provide circular polarization?

You'll find an answer for this month's riddle, another interesting, antenna-related web site, and much more, in next month's issue of *Monitoring* Times. 'Til then Peace, DX, and 73.

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# **DeLorme's GPS Receiver and Mapping Programs**

he three initials GPS have become part of our everyday language. Few people on this earth

would fail to recognize that it stands for global positioning system. This constellation of

satellites allows a user to find his position within 500 feet or better anywhere on the earth. All it takes is a calculator-sized GPS receiver. Alternatively, some GPS receivers can be connected to a personal computer or laptop. Although bulky, the color graphics afforded on a laptop can provide stunning detailed maps add- Figure 1 - Earthmate GPS Re-GPS.



ing to the power of the ceiver Attached to Laptop

#### What Computer Does It Run On?

Road Warrior is not a lightweight

when it comes to computer/hardware requirements. You will need as a minimum a Pentium 150 MHz, 32 MB RAM, CD-ROM drive, super VGA, 16 bit color monitor, mouse/trackball, 270 MB hard drive space and Windows 95, 98, NT 4.0 or Windows 2000. In addition, some of the best features of Road Warrior require an additional 22 MB of hard drive space, a sound card, speakers and microphone. We'll take a look at these voice features in a minute.

Of course, if you want to use the GPS functions, it requires a GPS receiver as well. Although we used Road Warrior with the DeLorme Earthmate, it can also be used with other GPS receivers such as

Garmin, Magellan, Rockwell, Eagle and Trimble.

#### Installation

Road Warrior comes on two CDs; one installation and the other program. This install is not fast, since lots of data is being stored on your PC. Total time is a solid 11 minutes on my 266 MHz Pentium II using Windows 98 and 64 MB of RAM. This includes the "Where Am I?" module and Microsoft's speech recognition engine version 4.0, which is included on the install CD.

Next the Earthmate GPS (with batteries installed) was connected to the computers' COM's 1 port via the supplied cable.

#### Set-up and Use

Road Warrior's screen is very intuitive and simple to use. See Figure 2. The screen is divided into a number of sections. The largest is the resulting map. Here we can see the word "DeLorme" and a dot just below Route 95. The dot is the result of a GPS fix taken while the product was at DeLorme's Maine Headquarters.

#### This Must Be Earth, Mate!

DeLorme's Earthmate is an example of a computer-controlled GPS receiver. It has been designed to connect to a computer's COM (serial) port. Since it has no display or controls of its own it must be used with a computer or a Palm handheld. It is a 12 channel L1 C/A code type GPS and weighs in at 7 oz. with batteries. It can be powered for up to ten hours by four AAA batteries; or from the computer's USB port with optional cable.

Earthmate is priced at \$159.95. See Figure 1.

#### Road Warrior!

DeLorme's main business since 1976 is map making. Their first venture into computer mapping occurred in the mid 1980s. Their first CD-ROM product was Street Atlas USA, released in 1991, and reviewed in this column. These guys have been at it for quite some time and produce some of the best available mapping programs on the market.

Their latest effort is Street Atlas USA -Road Warrior Edition. I'm sure Mel Gibson, star of the movie with the same name, is jealous! This program does it all, and very well. Finding places, route mapping, route navigation via GPS, printing maps and more, are features of Road Warrior.

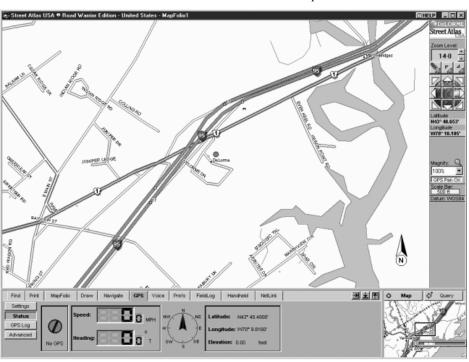


Figure 2 - Street Atlas USA - Road Warrior Edition Main Screen

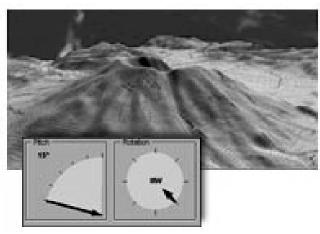


Figure 3 – Topo Version 3.0 Showing Its Stuff on Mt. St. Helens

Now jump down to the lower part of the screen. Here we can see the "live" GPS information such as longitude, latitude, elevation, speed and direction. Since this is a canned screen you can see that the dot to the left of Speed indicates "No GPS."

If we look to the lower left side of the screen we can see that Status is highlighted. By clicking on Settings we can choose the COM port and type of receiver we are using.

Next take a look at the horizontal line of menu button just above this area. The GPS is highlighted since we are displaying one of the GPS info screens. These eleven "buttons" are the heart of Road Warrior's control.

The Earthmate took about 13 minutes to download enough GPS satellite almanacs to be able to accurately determine my position. So the first time you use the system you must be patient.

#### True Interactive Voice!

You know, many programs promise Voice Command on their product packaging, and don't deliver the goods. Road Warrior is just the opposite. I had to dig into its manual to find the voice features. They are there. And, they are REAL!

DeLorme has done a very nice job of minimizing keyboard use. Clearly they were thinking of a car or truck driver as the end user. For example, if you wish to scroll the displayed map to the right all you have to say is "Pan right" and Road Warrior obeys. There are ten screen control voice commands including variations of Pan and Zoom, and they all worked great. However, this was in the confines of a quiet new Pontiac GrandAm. Still, it was very impressive.

The Maine boys did not stop there. The GPS-enabled Road Warrior will speak enroute directions to you such as "Left turn coming up." Thanks, HAL! It's pretty freaky the first time the computer "drives" you to town.

If you miss the instruction all you have to say is "Again" and Road Warrior will repeat the last instruction. There are sixteen additional Navigational Voice commands including; Show next turn, Center map on turn, Directions, Show route, and (my favorite) Shush, which silences voice navigation.

This voice interface is one of the best implementations I have used. It's perfect for this automobile driver-user application.

With a price of \$44.95. Street Atlas USA Road Warrior Edition, with its detailed street maps, navigation and routing functions, GPS

location capability and voice commands and directions, is a real bargain.

#### Topo USA Version 3.0

This is another DeLorme product, which can be used with their GPS receiver. We reviewed an earlier version of this product a while back. The screens were so interesting the art director at Monitoring Times decided to give them a color printing. Topo must be special since that was the first time in my ten years of writing this column that I got color!

Topo version 3.0 delivers the same high resolution, 3-D elevation maps, but now includes a new 3-D engine, automatic trail and road routing, shaded relief on two dimensional maps, land cover and use information for more realism. Figure 3 shows a beauty from Topo version 3.0 of Mt. St. Helens in the state of Washington.

Topo version 3.0 covers the entire USA on its six CDs plus an install CD. Its hardware requirements are similar to Road Warrior. However, it requires more hard drive space and suggests that a Pentium II of 233 MHz or higher be used.

At a price of \$99.95 this product is a must for avid hikers and campers.

#### Use With Palm Handhelds

As we discussed in our previous article on the Earthmate, with the purchase of the optional Palm cable from DeLorme, the Earthmate can be controlled by Palm handhelds. Although many of the advanced features such as voice commands/control are not available to the Palm user, preprocessed maps can be downloaded to the Palm and used with real-time GPS positioning information. For use with Palms, the Solus Basic program is required and can be downloaded from their web site at http:// www.delorme.com . Alternatively, Solus Pro can be purchased from DeLorme.

Just a few short years ago we could

not conceive of what the year 2001 would bring. Today, with our eyes opened, we are well aware of the times we live in.

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# **Synthesizers and How they Work - Part 2 Phase Noise and Reciprocal Mixing**

ne of the main problems with frequency synthesizers is the fact that some designs generate high levels of phase noise. Over the years they have received a bad press as a result of this. However it is possible to design some very good low phase noise synthesizers. The problem is often that receivers and transceivers are designed for low production costs, and this naturally means that some short cuts are needed.

#### What is phase noise?

Phase noise is present on all signals to some degree and it is caused by small phase (and hence frequency) perturbations or jitter on the signal. It manifests itself as noise spreading out either side from the main carrier as shown in Figure 1.

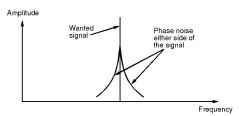


Fig. 1 - Phase noise on a signal

Some signal sources are better than others. Crystal oscillators are very good and have very low levels of phase noise. Free running variable frequency oscillators normally perform well. Unfortunately synthesizers, and especially those based around phase locked loops, do not always fare so well unless they are well designed. If significant levels of phase noise are present on a synthesizer used as a local oscillator in a receiver, it can adversely affect the performance of the radio in terms of reciprocal mixing.

Some oscillators have phase noise levels that are quoted in their specifications. Any high quality signal generator will have the level of phase noise specified, as do many high performance crystal oscillators used as standards. Their performance is generally specified in dBc/Hz and at a given offset from the carrier. The term dBc simply refers to the level of noise relative to the carrier, i.e. -10 dBc means that the level is 10 lower than the carrier.

The bandwidth in which the noise is measured also has to be specified. The reason for this is that noise spreads over the frequency spectrum. Obviously the wider bandwidth that is used, the greater the level of noise that will pass through the filter and be measured. To prove this, just try selecting a different bandwidth on a receiver and check what happens to the noise level. It will rise for a wider bandwidth and fall when a narrow bandwidth is used. Although it is most convenient to express noise per 1 Hz bandwidth, measurements are usually made using a wider bandwidth because it is difficult to obtain 1 Hz bandwidth filters. The correction is made mathematically.

Finally the level of noise varies as different offsets from the carrier are taken. Accordingly this must be included in a specification. A very good oscillator might have a specification of -100 dBc/Hz at 10 kHz off-

It has already been mentioned that the level of phase noise changes as the offset from the carrier changes and for "simple" signal sources like crystal oscillators or variable frequency oscillators the phase noise reduces as the frequency from the main carrier is increased. For frequency synthesizers the picture is a little more complicated as we shall see.

#### Phase noise in synthesizers

Each of the components in a frequency synthesizer produces noise that will contribute to the overall noise that appears at the output. The actual way in which the noise from any one element in the loop contributes to the output will depend upon where it is produced. Noise generated by the voltage-controlled oscillator (VCO) will affect the output in a different way to that generated in the phase detector for example.

To see how this happens take the example of noise generated by the voltage controlled oscillator. This will pass through the divider chain and appear at the output of the phase detector. It will then have to pass through the loop filter. This will only allow through those components of the noise that are below the loop cut-off frequency. These will appear on the error voltage and have the effect of cancelling out

the noise on the voltage controlled oscillator. As this effect will only take place within the loop bandwidth, it will reduce the level of noise within the loop bandwidth and have no effect on noise outside the loop bandwidth.

Noise generated by the phase detector is affected in a different way. Again only the components of the noise below the loop bandwidth will pass through the low pass filter. This means that there will be no components outside the loop bandwidth appearing on the tune voltage at the control terminal of the voltage controlled oscillator, and there will be no effect on the oscillator. Those components inside the loop bandwidth will appear at the oscillator control terminal. These will affect the oscillator and appear as phase noise on the output of the voltage controlled oscillator.

Matters are made worse by the fact that the division ratio has the effect of multiplying the noise level. This arises because the synthesizer has the effect of multiplying the frequency of the reference. Consequently the noise level is also multiplied by a factor of 20 log N, where N is the division ratio.

Noise generated by the reference undergoes exactly the same treatments as that generated by the phase detector. It too is multiplied by the division ratio of the loop in the same way that the phase detector noise is. This means that even though the reference oscillator may have a very good phase noise performance this can be degraded significantly, especially if division ratios are high.

Dividers normally do not produce a significant noise contribution. Any noise they produce may be combined with that of the phase detector.

The combined noise of the loop at the output generally looks like that shown in Figure 2. Here it can be seen that the noise within the loop bandwidth arises from the phase detector and the reference. Outside the loop bandwidth it arises primarily from the voltage controlled oscillator. From this it can be seen that optimization of the noise profile is heavily dependent upon the choice of the loop bandwidth. It is also necessary to keep the division ratio in any loop down to reasonable levels. For example a 144 MHz synthesizer with a 12.5 kHz step size will require a



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division ratio of 11520. In turn this will degrade the phase detector and reference phase noise figures by 81 dB inside the loop bandwidth - a significant degradation by anyone's standards! Provided that division ratios are not too high then a wide loop bandwidth can help keep the voltage controlled oscillator noise levels down as well.

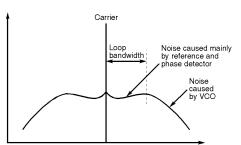


Figure 2 - Noise profile of a typical synthesizer

#### Effects of phase noise

Phase noise can have a number of effects. For amateur radio SSB transmitters the main effect is that splatter appears either side of the main signal. This results from the phase noise either side of the signal rising and falling in line with the amplitude variations of the main signal.

For receivers the main problem is an effect known as reciprocal mixing. To look at how this occurs take the case of a superhet receiver tuned to a strong signal. The signal will pass through the radio frequency stages, and then in the mixer it will be mixed with the local oscillator to produce a new signal at the right frequency to pass through the IF filters. When the local oscillator is tuned away by ten kilohertz, for example, the signal will no longer be able to pass through the IF filters. However it will still be possible for the phase noise on the local oscillator to mix with the strong incoming signal to produce a signal that will

fall inside the receiver pass-band as shown in Figure 3. This could be sufficiently strong to mask out a weak station.

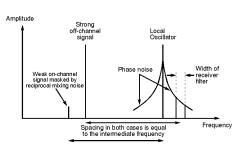


Figure 3 - The way in which phase noise on a signal results in reciprocal mixing

#### Specifications

A number of different methods are used to define the level of reciprocal mixing. Generally they involve the response of the receiver to a large off channel signal. To perform a reciprocal mixing measurement is rarely easy. The signal generator must always be much better than the receiver, otherwise the performance of the signal generator will be measured! To overcome this many people use an old valve (tube) generator because their performance is often very good in this respect.

A measurement can be made by noting the level of audio from a small signal with a BFO turned on. The signal is then tuned off channel by a given amount, normally about 20 kHz, and then increased until the audio level rises to the same level as a result of the phase noise from the receiver. As the noise level is dependent upon the bandwidth of the receiver, this has to be specified as well. Generally a bandwidth usable for SSB is used such as 2.7 kHz.

A good HF communications receiver might have a figure of 95 dB at a 20 kHz offset using a 2.7. kHz bandwidth. This figure will improve as the frequency offset from the main channel is increased. At 100 kHz one might expect to see a figure in excess of 105 dB or possibly more.

Another way of measuring the phase noise response is to inject a large signal into the receiver and monitor the level needed to give a 3 dB increase in background noise level. As a number of different systems are in use it is often best to study the reviews performed by the same people when comparing different rigs.

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### **Ask Another Bob**

#### How can I build a scanner?

To be blunt, it's not worth building a scanning receiver from the ground up. You would be better served to buy an old crystal controlled scanner and learn about how it works. Make sure you can obtain a schematic diagram – or better yet, a complete service manual – before choosing the scanner.

Heath offered both crystal and programmable scanner kits at one time but left the market several years ago. Hamtronics (http://www.hamtronics.com) sells simple crystal controlled and switch programmable receiver kits, but they don't scan. For more information, contact Hamtronics at 65 Moul Rd., Hilton, NY 14468-9535, telephone (716) 392-9430.

# How can I measure scanner performance quantitatively?

The answer to this question could span several columns, so I will just summarize the high points here.

Making quantitative measurements that can be compared with the manufacturer's specifications requires good, calibrated test equipment. Two-way radio service shops have the necessary equipment and technicians to perform the tests. Make a list of the measurements you want, including the frequencies at which you want the sensitivity and image rejection measured. Bring the list to a commercial two-way radio service shop, not a CB repair shop, and request a price estimate.

If you can't borrow the required test equipment, you can buy it at considerable cost. I've bought new and used test equipment from dealers, at hamfests, through Usenet's misc.industry.electronics.marketplace and rec.radio.swap news groups, and at auction through eBay (http://www.ebay.com). Amtronix has a good assortment of used radio test equipment (http://www.amtronix.com). Join the test-equipment email list at http://www.qth.net,



Figure 1 Helper Instruments SL105 Sinadder.

where members discuss and sell test equipment.

A stable RF signal generator is most important. It should be able to produce narrow FM signals with adjustable deviation and AM signals with adjustable modulation. The output level should be calibrated in dBm or microvolts.

Older, AM-only generators, like those made by Heath, EICO, and B&K, won't do. Instead, look for models like the Hewlett-Packard 8656A, HP 8657, HP 8640B (opt 002), Racal 9087, Ailtech 380K11, Fluke 6071A, Fluke 6060A, or the Marconi 2019. Gigatronics and Wavetek made suitable models, too. Expect to pay between \$800 and \$1600. These models have an upper frequency limit 1000 or 1300 MHz, so you won't be able to measure scanner performance in the 2000 MHz range without a more expensive signal generator.

Most of the receiver industry has adopted the 12 dB SINAD (signal plus noise and distortion) metric for specifying FM sensitivity. To make a SINAD measurement, you use an RF signal generator to inject an FM signal modulated at 3 kHz with a 1 kHz tone into the receiver's antenna jack. A SINAD meter or audio analyzer is connected across the speaker leads and you adjust the signal generator's output level until the SINAD meter reads 12 dB.

Better SINAD measuring devices contain a high quality 1 kHz audio tone generator that is used to modulate the RF signal generator. You can obtain used Motorola or Helper Instruments SINAD meters at hamfests or at online auctions for under \$100. Look for a Helper Instruments Sinadder Linear 5 in good condition (fig. 1). It contains a sensitive wideband voltmeter, which is useful for measuring signal to noise ratio and audio output power. A good, used HP 8903A or Boonton audio analyzer can cost \$1000 or more, but enables you to measure audio frequency response, too.

A good signal generator used in conjunction with a SINAD meter permits you to measure sensitivity, image rejection, MDS (minimum discernible signal level), and modulation acceptance. Modern communications test sets, like those made by Motorola, HP, and IFR, mate a signal generator and SINAD meter with circuitry for testing transmitters.

Measuring IMD dynamic range (a measure of intermod immunity) and blocking dynamic range requires a second signal generator, a hybrid combiner to sum the two signals, and a calibrated adjustable attenuator to control the combined signal level.

The ARRL Handbook for Radio Amateurs (fig. 2) shows how to build a hybrid combiner. If you want to learn how receivers work and how to measure them, pick up a copy of the Handbook. It is the American Radio Relay League's largest and best-known book and is published annually. I own a dozen or so editions, dating back to 1957.

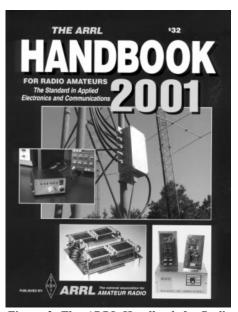


Figure 2. The ARRL Handbook for Radio Amateurs 2001.

The 2001 edition paperback edition sells for \$32 and is available at bookstores, radio dealers, and directly from the ARRL, 225 Main St., Newington, CT 06111-1494, telephone 1-888-277-5289. The ARRL web page is http://www.arrl.org.

#### Can I add alpha labels to a scanner not so equipped?

I don't know of a way to add alpha labels to a scanner lacking them. Software is available for computer-controllable scanners which supports alpha labels, but the labels appear on the computer monitor instead of the scanner's display.



Figure 3. Talk group cheat sheet.

The simplest and oldest way to remember frequency and talk group assignments is to carry a small list. I used a spreadsheet program to print a talk group "cheat sheet" in 6-point type for a friend with a BC-245XLT. I laminated the list (fig. 3) for durability and he carries it in his wallet.

#### I want to buy a crystalcontrolled air band scanner. Can you suggest a model?

Aircraft transmissions employ AM while most other services transmit FM. Most modern programmable scanners can receive 108 - 136 aircraft signals, but very few crystal air band models were manufactured. This was due to the additional cost of AM detector circuitry, front end filtering, and limited demand.



Figure 4. Regency ACT-R-92AP Flight Scan.

Suitable crystal models include the Regency ACT-R-92AP Flight Scan (fig. 4), Regency HX750 handheld, Electra Bearcat Five-Six handheld, the Bearcat 15, and Radio Shack PRO-48.

Scanner crystals cost \$5 or more each, so the cost of obtaining a used 8-channel air scanner and purchasing new crystals approaches the price of a used, programmable model.

#### **Collectors'** Corner

The Regency TM-H2 is a crystal-controlled monitor receiver built in the 1960s. It is an early solid state model that covers 150 - 175 MHz. Its TM-L2 cousin tunes the 30 - 50 MHz VHF-low band. The double con-

version circuitry employs both 13 and 0.455 MHz IFs.

These radios are housed in a bluegreen steel cabinet and are large by today's standards. They can be powered by an internal 117 VAC power supply or by a 12 VDC source. The internal speaker is mounted on the left side and an external speaker may be connected to a screw terminal strip on the rear. Options include an alert tone decoder and top mounted leatherette handle.

I found a dusty and rusty 6-channel specimen (fig. 5) at a local hamfest. The chassis bears a 1964 date stamp. Two of the knobs have been replaced and a BNC connector soldered to the chassis replaces the



Figure 5. Regency TM-H2 manu-factured in 1964.

original antenna connector.

Don't pay more than \$10 for one of these radios. They require special crystals with wire leads that must be soldered to the channel selector switch and tweaked on frequency by a trimmer capacitor.

# More than just radios....

You probably know all about the great value of **ADI** brand transceivers, but **PRYME Radio Products** makes more than just radios. In fact, we manufacture a full line of aftermarket accessories for all kinds of radios, not just our own! Our line includes accessories for Kenwood, Icom, Yaesu, and many more! From Family Radios, to scanners, to amateur or commercial handheld radios, we have the right item for the job. Our accessories are reliable, innovative, and affordably priced.

#### **Audio Accessories**

Our innovative audio products have made us famous. From the comfort of our SPM-400 mini-boom microphone to the low-profile of our EH-1 "invisible" ear phone and SPM-700 surveillance mic, we have the right accessory for the job!



#### Antennas for Handhelds

Most stock antennas for scanners or portable radios are extremely poor. Upgrading to a better antenna can make a huge difference in performance. Our antenna products are specifically designed for maximum performance and durability.



#### Batteries / Portable Power

We offer many models of rechargeable battery pack for today's most popular handheld radios, as well as a number of portable "power stations" for those who need "power to go."





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# Icom's Super Neat IC-706MkIIG - Part II

efore we get into the test drive portion of this slick little radio, a brief recap for those who are picking up *MT* for the first time.

There is a lot to like about the IC-706MkIIG. It's small, just 6.6" wide x 2.3" high x 7.9" deep; light, just 5.5 pounds, and it has great coverage: receive, 30kHz-1999.999 MHz and 400-470 MHz; transmit, all ham bands from 1.8 MHz to 450 MHz, with modes including USB, LSB, CW, /RTTY (FSK), AM, FM and WFM (receive only).

Power output on HF and six meters is 5-100 watts (SSB/CW/FM/RTTY) and 2-40 watts AM; on two meters 2.5-50 watts (SSB/CW/FM/RTTY), 2-20 watts (AM) and 2-20 watts (AM); and on 440 MHz 2-20 watts (SSB/CW/FM/RTTY) and 2-8 watts (AM).

The "706" packs a lot of capability, including tone encode, tone squelch, 102 alphanumeric memories (99 regular, 2 scan edges, 1 call), second VFO, crossband split capability, CW keyer, speech processor, and voice-operated transmit, plus some digital signal processing capabilities as well.

A detachable front panel/display and optional remote separation cable make it possible to install the main "box" of the 706 in the trunk of an automobile and mount the front panel and microphone to the dash. There are just 12 buttons, two pairs of concentric knobs, and the tuning knob on the face of the 706, plus a large and legible backlit liquid crystal display (LCD) that shows what's going on with this transceiver. Many of the buttons have lighting for easier operation in the dark.

#### Hands-on Experience

In my experience in testing radios both here and for *Passport To World Band Radio*, I've found that when a radio has rela-

tively few controls, as the 706 does, and a lot of capabilities, there is a very large potential for creating a rig that can be absolutely maddening to operate. When a limited control set and sophisticated operating options collide, the loser is usually the operator.

Fortunately, I am happy to report that is definitely not the case with the 706. Despite the paucity of controls, the 706 is actually easy to operate. In fact, this rig came within an angstrom or two of passing the Elliott Idiot test. – What's that? I'm glad you asked. The Elliott Idiot test asks the following question: can one Jock Elliott do

THE THE SELECT THE SEL

The IC-706MkIIG delivers a whole lot of hamming at a reasonable price.

most of the major functions of this rig without consulting the manual?

With the 706, I was able to do all the functions I wanted except set the repeater offset for two meters, for which I had to consult the manual. As a result, the 706 gets a B+, not an A, in the Elliott Idiot test.

The reason the 706 does so well is that the good folks at Icom have really done their homework. While there isn't a "knob for every job," there are controls for the things that need to get done most often.

For example, since there is no numeric keypad, there is a button for selecting the tuning step. That makes it really easy to get from one place to another without a lot of endless knob twirling. There is a Mode but-

ton and a pair of up and down Band buttons. The Lock button is very handy for mobile operation. One of the functions of the Tuner/Call button is to operate the optional outboard AT-180 HF/50 MHz automatic antenna tuner. (Hold the button for two seconds, and the tuner does its thing. It's superb.)

Most of the other functions are handled by five buttons. Four of them are located under the LCD. Press the left-most button and you step through a series of menu choices that are shown on the bottom of the display. The M2 menu, for example, controls memory operations. When it is displayed, the three Function but-

tons to the right control

memory write (MW), memory clear (MCL) and swapping between VFO and memory (V/M). The M1 menu offers a different set of choices for the Function buttons.

If you press the Display button just to the right of the LCD, you are taken to different sets of menus, such as S2 for scan functions, and G1 for band scope. It takes about two min-

utes to understand how the Menu and Display buttons change what the Function buttons do, but after that the entire scheme works really well. Hats off, too, to the manual writers at Icom for a job well done.

I've saved the best part for last: the performance of the 706 simply sparkles. I got rave reviews for my audio quality on 2 meters, and I enjoyed operating on ten meters with the 706. For the casual ham operator who wants a whole lot of radio in a compact, reasonably priced package, the 706 delivers, and then some. The IC-706MkIIG delivers all this at a street price under \$1,000; the AT-180 should sell for less than \$500. For more info, check out http://www.icomamerica.com.



# Flight Explorer Personal Edition

By Ian Doyle

For US aviation hobbyists or for those whose interest lies in HF, you may be interested in Flight Explorer Personal Edition. This is a fabulous product which enables listeners to track real-time aircraft flight-planned to/from the USA and certain transoceanic routes to/from the USA. Flight Explorer has been in existence for a number of years and, for just a small subscription fee, it enables the individual to access information usually available only to airlines.

Flight Explorer will run on a "reasonably fast PC" using a standard internet connection (dial up or dedicated). The aircraft data is provided from the Flight Explorer (FE) data center and will provide the user with a real-time graphical image of aircraft currently flying at any altitude over the US (Including Alaska and Hawaii), and US "tracked" aircraft over parts of Mexico, Canada and the Atlantic and Pacific Oceans.

Registering is easy via a secure signup from the Flight Explorer Personal Edition section of Avweb (http://www.avweb.com/sponsors/fe/). After registering, you can download the client software and once payment has cleared you will be sent the install code for the software. Once installed, you will be able to fully access the web page and use the product proper via the user selected ID and password.

Two versions of the software are available; the one for which most monitors opt is Personal Edition, which costs USD \$9.95 per month for 10 hours usage, charged monthly to your credit card. This should be adequate for most hobbyists. If, however, you are feeling flush, there is a \$250 Professional Edition which encompasses a number of enhancements aimed at the corporate airline or professional user; it has a variety of additional features as well as unlimited connect time.

or out of the USA.

As a large percentage of HF aviation listening is done over the Atlantic Ocean, Northern Canada, The Caribbean and South America, the advantages of access to a package like this are obvious. Being able to see graphically what you

can hear increases the interest enormously.

When you first log on to the site you will see a picture of the world with every aircraft lodged with the centre represented as a dot. It is, however, possible to click and drag on a particular area, for example, the Caribbean. So if we're listening to the HF Caribbean Net and want to identify a particular aircraft that is providing a position report on HF, simply right click on the aircraft icon and then

click "Properties." The aircraft type, airline, position, height, speed arr/dest airport will all be displayed. If you "tag" an aircraft, this informa-

tion will be retained as the aircraft moves across the screen.

We may, of course, actually hear an aircraft and wish to interrogate the flight details. Press the horizontal aircraft icon in the top right of the screen; this will clear the screen in readiness for our query. Now press the "Quick Filter Option" and key in the flight number heard. If this is flight planned into or out of the USA it will appear as a dot on the main screen. Ensure that the aircraft you are

monitoring does actually correspond to the one are that you can see visually on screen; otherwise the aircraft may not appear, because of being outside the interrogated range.

Numerous other search/filter options are available in this mode. You can input Flight Numbers, Aircraft Types, or Airport Codes; all aircraft currently in the air with a live flight plan to or from the USA will appear. Again, you must remember to clear the screen after each query. It is also possible to overlay the latitude and longitude coordinates, which is particularly useful over the North Atlantic, Canada and Pacific Area.

One word of caution; in some cases of tran-

soceanic routes beyond radar range, the data provided can appear up to 40 minutes old, as only the last reporting point is provided. Hence, the reason the picture over the North Atlantic consists of rows of dots in vertical groupings. Despite this limitation there are still numerous advantages in using the software.

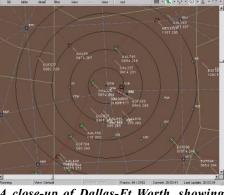
Although not relevant to the UK, various overlays can also be added with the additional of beacons,

navaids, airways and ATC sectors within the USA. This is useful for monitoring the Caribbean area, where, sadly, aircraft serials do not appear.

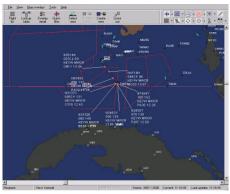
Another very useful feature is the "Flight List Look Up." A list of all tracked aircraft in the system will be displayed, showing aircraft ID, origin, destination, aircraft type, altitude, speed, departure time, ETA, or status for each aircraft. The list can be sorted by any of the criteria just by clicking on the title bar.

Once again, this is a superb product and is bound to be of tremendous interest to the serious HF monitor with an interest in aircraft. Although there has been much criticism of the Internet, there seems little doubt that technology that would have been unthinkable five years ago is now a reality, I feel sure that many readers would agree that such developments will only enhance the future of radio monitoring and the general radio listener!

Editor's Note: This review originally appeared in Shortwave Magazine. The author, based in the UK, uses Flight Explorer to monitor international flights while listening to HF communications. However, the program follows all tracked flights over land as well. If you don't have an airport nearby, tune in to streamed audio from several major control towers while you watch the planes on screen. See June 2001 for Jean Baker's review.



a position report on HF, A close-up of Dallas-Ft Worth, showing simply right click on the navaids, airways and ATC sector boundaries



Tracking 150 GA aircraft from Key West, Fla. (EYW), to Grand Cayman, B.W.I., for the 1998 Cayman Caravan.

#### **Using Flight Explorer**

Once you have an account and user ID, and you have successfully run the set-up programs and logged onto the site, what can you expect? Well, this is truly an Aladdin's cave of treasures. Flight Explorer will allow the user to monitor any aircraft which is flight planned in

# What's NEW Tell them you saw it in Monitoring Times

## Grove Military Frequency Directory

Monitoring military traffic can be as mundane as listening to small-town dispatch channels, as sophisticated as an interagency disaster drill, or as intriguing as a spy novel. The first challenge is to find the frequencies, and that's not been easy since the Government Master File (GMF) was classified Confidential in 1982. So, the *Grove Military Frequency Directory* comes as a welcome addition, especially given its comprehensive coverage and surprising accuracy.



"Gathering information for this directory has been extremely difficult," says author Larry Van Horn. "Most was gathered through personal contact with hundreds of active radio monitors who live near military bases."

The Grove Military Frequency Directory, which numbers many hundreds of pages, could only have been published on CD-ROM due to its size. The disk is a compendium of the information originally sold state-by-state. Not only does it incorporate frequency information for all 50 states, all military services, all military bases, plus related agencies such as the FAA. but it contains full frequency information for civilian airports with any kind of military presence as well as all Air Route Traffic Control Centers (ARTCC).

Most of the information is presented by state and is organized alphabetically by city, base, or facility. Since most frequencies are VHF/UHF for local coverage, there is no frequency cross-reference or by-agency listing.

The supplemental material contained in the included Department of Defense (DOD) General Planning and worldwide Flight Information Publications (FLIPs) is enormous. You'll find terms defined, procedures spelled out, codes explained like Notice to Airmen Messages (NOTAMs) and aviation weather codes. You'll also find sketches of airports worldwide, and a global chart of LORAN coverage.

And, don't overlook the "Instructions" link on the *MFD* opening page! You might think these are tips for getting around the files in Acrobat Reader (those come on a separate sheet) or the usual caveats and acknowledgements. Instead, this is an excellent introduction and overview of military communications and nationwide nets, written by Larry Van Horn. (This introduction is also included in the individual states if purchased separately.)

Grove Military Frequency Directory is presented in PDF format suitable for printing. Using a recent version of Adobe Acrobat Reader (included on the disk), you can search for any string of characters or numbers, you can select and copy text so you can manipulate the information to suit your needs. The CD-ROM (SFT31) can be purchased from Grove Enterprises for \$39.95 by calling 800-438-8155, email order@grove-ent.com, or write P.O. Box 98, Brasstown, NC 28902. States may still be purchased separately for \$9.95, but delivery is by email attachment only.

## New Scanners from Radio Shack

...or should they be called upgrades? Two new models have been approved by the FCC: The Pro-93 (20-523) covers 25-54, 108-174, 216.0025-225, 406-512, 806-823.9875, 849-868.9875, 894-960, 1240-1300 MHz. It is a handheld unit made by GRE in China. It tracks Motorola Types I/II and EDACS trunking systems.

The Pro-2053 (20-466) has exactly the same frequency coverage, except that it is a base model. It also

has a digital weather alert, which will sound an audio tone and the text of the alert will print to the display.

# Speco Communications Extension Speaker

CSI/SPECO has a nifty little extension speaker that can dramatically improve the intelligibility of ham, CB, GMRS, land mobile, scanners, and other radios with limited-audio speakers.

The CBS-500 features an 8ohm, 3", 5-watt-capacity speaker in a low-glare, black cabinet, protected by a metal grill. A tilt bracket invites overhead or under-dash mounting.



The assembly is sound-contoured to reinforce voice frequencies, and it does so with clean, crisp audio that cuts through environmental noise. Two separate rocker switches provide pulse-noise attenuation as well as instant volume reduction for remote locations.

The CBS-500 includes a 6-foot shielded audio cable terminated in a standard 1/8" (3.5 mm) phone plug to fit external speaker and earphone jacks.

The Speco extension speaker (SPK1) is available from Grove Enterprises for \$19.95 plus shipping (PO Box 98, Brasstown, NC 28902; 800-438-8155; http://www.grove-ent.com).

## Grove SP-200 Sound Enhancer

If you require something more sophisticated, Grove Enterprises has announced their new and improved

SP-200C Sound Enhancer. The Sound Enhancer is a high-quality, agile audio processor with sophisticated passband contouring controls for clarifying and recording voice, music, and data. Designed for audio enhancement in serious communications applications like government/military SIGINT and audio surveillance, the Grove SP-200C is also appropriate for broadcast engineering, amateur radio, shortwave listening, and scanner monitoring.



The Grove SP-200C offers variable-bandpass notch/peak function, separate bass and treble equalization, adjustable-threshold pulsenoise clipping, selectable-hold-time recorder activation, audio level, variable-hang noise squelch, and amplification. Processed sound is available through the high quality internal speaker, or from a headphone jack for secure installations or concentrated monitoring in noisy environments.

Powered by 12 VDC for mobile/portable environments, a 120 VAC adaptor is included for fixed installations. The (SPK3) SP-200 is priced at \$199.95 from Grove Enterprises.

## Midland's World's Smallest FRS Radio

Midland's model F-10 radio is touted to be the smallest of all the 14 channel Family Radio Service units with a 2 mile range; it is expected to be in stores in July. The tiny new radio offers features previously found only on top-of-the-line models.

Features include: 14 channels, page/call, tone and visual transmit indicators, channel scan,

# natis

Tell them you saw it in Monitoring Times



key lock, low-battery indicator, liquid crystal display (LCD) readout, backlighted display, speaker/ microphone jack, (and) allows inunit charging of batteries; stealth squelch quiets popping noises between transmissions. Unit operates on three AAA cells; hand strap and flexible antenna included.

The F-10 has an expected street price of \$24.95 each or \$49.95/pair. A full line of accessories is available, including chargers, headsets and lapel microphones. For more information, visit:

http://www.midlandradio.com.

#### **Wireless** Spectrum Finder

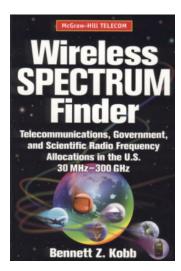
by Bennett Z. Kobb

Few radio aficionados will deny that Benn Kobb probably has a handle on spectrum allocations unequalled in the industry. His previous spectrum guides were very informative, and this latest edition - all 500 pages won't disappoint the most avid frequency hound!

Covering 30 MHz-300 GHz, this ultimate reference breaks the VHF/UHF/microwave spectrum into some 350 bands, detailed in easy-to-understand text. Kobb brings us all of the answers - legal issues, technical characteristics, allowable uses, geographical considerations, and more.

Additional chapters provide insight into lawmaking, regulatory trends in technology, even helpful hints regarding sources and pro-

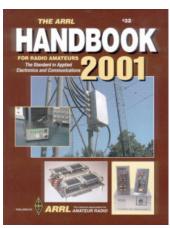
Whether you are seriously into radio as a hobby or a profession, this is the comprehensive guide to spectrum, VHF and above.



Wireless Spectrum Finder is \$49.95 from McGraw Hill, 2 Penn. Plaza, 12th Floor, New York, NY 10121; ph. (212) 904-5449, or email cathy markoff@mcgraw-hill.com

#### The ARRL Handbook for Radio Amateur

Now in its 78th edition, the ARRL Handbook continues to be the leading technical publication for experimental radio communications. While amateur radio has seen revo-



lutionary developments over the decades, there is still much room for individual experiments and equipment building. In this venue – theory and practice – no one comes close to this annual ARRL publica-

Honed to perfection over the years, filled with crisp photos and line drawings, the Handbook's 1200 pages reflect the cumulative knowledge of nearly a century of experimentation in radio. Transmitters, receivers, antennas, power supplies, transmission lines, digital signal processing, test equipment, satellite communications, audio and RF circuits, repeaters, direction finding, troubleshooting, filters - it's all there in this giant compendium.

And, at only \$32, it's the best source of information on the bookseller's shelf! The ARRL Handbook for Radio Amateurs -2001 is available from amateur radio suppliers and the American Radio Relay League (ARRL), 225 Main St., Newington, CT 06111; ph. (800) 243-7767.

#### Atoc assumes Alinco Service and US Distributorship

Beginning in May, Alinco's US branch made a major shift in distribution and customer service. For warranty repairs and customer service, or for product distribution to dealers, the new company handling these services is Atoc Amateur Distributing, LLC; 23 S. High St., Covington, OH 45318; (937) 473-2840. The transition was completed around the end of June.

Alinco's corporate function will now concentrate on designing and manufacturing new products from its headquarters in Osaka, Japan. In addition to its amateur radio products, Alinco is branching into related areas, such as the design and manufacture of high quality scanning receivers.

#### Worthwhile Links:

http://www.w7fg.com/- Vintage manuals for receivers and scanners for sale



http://www.radiostoreplus.com/-All-spectrum website for radio products, news, and great links



#### **MapSource** Recall

Garmin International has issued a recall for the US Waterways and Lights CD-ROM version 3.00 (Serial Numbers A0903821-A0907080), which turned out to have defective navigational data for sections of Coast Guard District Number 5, New Jersey through South Carolina. Contact your dealer for a free replacement with the correct data set.

Books and equipment for announcement or review should be sent to "What's New?" c/o Monitoring Times, P.O. Box 98, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to mteditor@grove-ent.com.

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AORCover III				
Austin Antenna				
Cellular Security Group81				
Communications Electronics 73				
Computer Aided Technologies 7				
Computer International 83				
Davis Instruments 81				
Grove Enterprises 15,31				
Grundig 5				
ICOM Cover IV				
John Figliozzi25				
Kevin Carey79				
KIWA Electronics				
Monitoring Times 90,91				
OptoElectronics Cover II				
Pattcomm 83				
Popular Communications 25				
Premier Communications 85				
Radiomap 27				
Radioworld Inc 79				
RC Distributing27				
Skyvision 81				
Small Ear 79				
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Universal Electronics				
Universal Radio 67				
Viking 9				
W5YI 19				
WiNRADiO 1				

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# Closing Comments

# **LPFM Hypocrisy?**

Guest Editorial by Doug Smith, W9WI

The first permits for new low-power FM stations (LPFMs) have now been issued. And again, full-license broadcasters are screaming about interference. Would you be surprised to learn that a legal low-power FM service has existed for years? Would you be surprised to learn that its stations can be licensed under frequency and distance separations that are not allowed for the new LPFMs?

LPFM enthusiasts probably know I'm referring to FM translators. These are low-powered relay stations, originally designed to extend FM service to isolated areas. Over the years, FM translators have also been authorized to fill coverage gaps in mountainous areas, and to overcome overload interference from more powerful nearby stations. Still later, noncommercial stations have been allowed to build nationwide networks of satellite-fed translators.

To avoid interference, FM radio stations must be separated by minimum distances both on the map, and on the dial. If there's a station on 95.5 in Nashville, a station on 95.3 will cause severe interference - unless it's 150 miles away. The FCC regulations establish specific minimum distances for specific dial separations and specific power classes. In general, stations in the same city must be at least 800kHz (0.8MHz) apart on the dial.

Of course, these minimum separations limit the number of stations possible in a given location. In theory a maximum of 25 stations is possible at any given location. And in most cities, all frequencies available under existing regulations are already in use; no additional stations are possible.

These regulations were established in the early 1960s. Older radios couldn't separate stations closer than 800kHz, or would drift from one station to another. As with most things in electronics, FM radios have improved immensely in the last 40 years. Arguably, the 800kHz separation is no longer necessary; it could be relaxed to 600kHz or even 400kHz. Such a change would make hundreds of new stations possible.

So the FCC argued when they first proposed the new LPFM service. The proposal retained protection for existing stations on the same frequency or 200kHz away, but deleted protection at 400 and 600kHz. Fearing interference, (or competition?) existing stations, through the National Association of Broadcasters, objected. The Commission reacted by putting 400kHz protection back into

the LPFM proposal.

That wasn't enough. After some lobbying, Congress chimed in. The Oxley bill would have killed the LPFM service altogether, but it was considerably weakened to only require the Commission to reestablish the 600kHz protection. Now, none of the additional channels made possible by relaxing 400 or 600kHz protection was available. Only those additional channels possible due to the lower power levels of LPFM stations can be used.

Let's say you live in West Memphis, Arkansas, 35°08'00"N/90°05'38"W. You want to build an 80-watt LP100 station on 90.5MHz. The LPFM regulations say your station must be at least 73km (44 miles) from any Class C1 station 600kHz away. Oops; you're out of luck. West Memphis is only 15 miles from the tower of WKNO-FM, a Class C1 station on 91.1. In fact, the FCC LPFM Channel Finder on the Internet says no LP100 station is possible in West Memphis; every channel is too close to an existing station.

I'm curious. Let's do a search in the FCC's online "FM Query" for West Memphis. What do we find? K213CN. An 80-watt translator, operating on 90.5MHz, at 35°08'00"N/90°05'38"W, only 15 miles from the WKNO tower. The same transmitting facilities that cannot be licensed as an LPFM station are actually operating as an FM translator.

You will have little trouble finding other examples. Check out K210BZ on 89.9MHz in Phoenix, Arizona. Or W201BE (88.1) and W207BB (89.3) in Buffalo, NY. Or W214AU (90.7) near Nashville. Browsing the FM Atlas and FCC database, I can find at least nine examples in the Phoenix area alone. In one case in Nashville, someone has applied to put a 90.7 translator on the same tower as an 80,000-watt station on 90.3!

Now, I've only been a broadcast engineer for 20 years and an Extra Class amateur for 25, so maybe I need someone else to explain the concept. An LPFM station, carrying programs originating in the local community, cannot be authorized in West Memphis because it would interfere. The same transmitter <u>can</u> be authorized if, instead of originating programs, it promises to pick up a St. Louis station off satellite and rebroadcast its signals.

It's amazing what lobbyists can do with the laws of physics.

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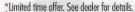
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